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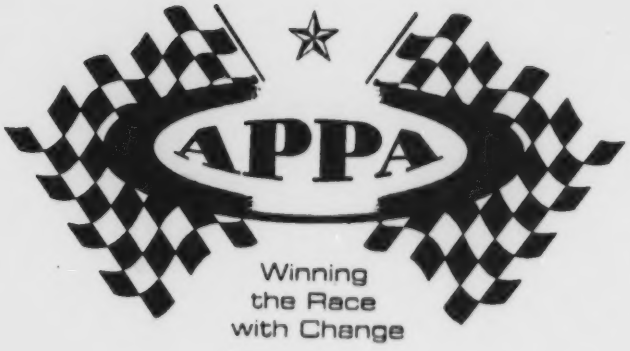
ABSTRACT

This volume presents 24 conference papers: (1) "Total Quality Management, or Nirvana--Are We There Yet?" by Gary L. Reynolds; (2) "Managing by the Seat of Your Pants: Vision, Innovation, and Creativity" by Roy M. Dalebozik; (3) "Understanding Cross-Cultural Issues in the Workplace" by Ann M. Jenkins; (4) "Drugs in the Workplace: An Ounce of Prevention" by Michael Gardner and Pat Bacon; (5) "Handling Layoffs With Compassion and Dignity" by Robert A. Getz; (6) "Managing the Facilities Portfolio" by Douglas W. Kincaid; (7) "Business Plan for Facilities Management Operations" by Jerry Black; (8) "Castles and Sheds: Facilities Management at a Czech University" by Jan Winkler; (9) "'Make/Buy' Competitive Procurement Programs" by William D. Middleton and others; (10) Downsizing Creatively: Doing More for Less" by Patrick J. Lawlor; (11) "The Classroom of the Future" by William Day; (12) "Master Planning Techniques for Success" by William R. Love, Jr.; (13) "Construction Management: The Owner's Perspective Revisited" by John Kreidich and Douglas K. Ault; (14) "Establishment and Application of a University Standards Policy" by Duane Day and Tim Lewis; (15) "Building a Base for Change" by J. R. Swistock and Michael P. Onder; (16) "Transportation Management at Cornell University" by William E. Wendt; (17) "Time for a (Landscape) Tuneup?" by David K. Scatterday and Cathy Walker; (18) "Thermal Energy Storage: A State-of-the-Art Approach to an Ancient Technology" by John E. Haley; (19) "Central Chilled Water Plant Expansions and the CFC Refrigerant Issue" by Johns S. Andrepont; (20) "Are You Prepared for the Race with EPA (Environmental Protection Agency)?" by James O. Roberts; (21) "Impact of the Clean Air Act on Campus Refrigeration and Air Conditioning" by Martin D. Ignazito; (22) "Implementing an Environmentally Safe Chilled Water System" by Theodore J. Weidner; (23) "Race Into the Twenty-first Century Fueled by Natural Gas" by Dorsey D. Jacobs; and (24) "Solid Waste Management: A Global Perspective" by Alan S. Bigger. Some papers contain references. An appendix lists annual meeting speakers. (JB)



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HUMAN RESOURCES MANAGEMENT

Total Quality Management, or Nirvana—Are We There Yet?

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Introduction

There has been much discussion recently about the new buzzword "Total Quality Management" in the press, on TV, and within the university community. There are many "experts" who have written books, created videos, and provided seminars on the topic of TQM. These include the acknowledged management theory experts, as recently presented on public television's presentation, "Quality ... or else?", such as Blanchard, Crosby, Deming, Feigenbaum, and Juran as well as many others who provide books and material on supervision, listening, managing, quality circles, etc. Each of these experts has identified a series of tasks or processes that they claim are essential in order to reach nirvana, i.e. Total Quality Management. In some cases the ideas are unique to the expert, in some cases they are complementary, and in other cases they are diametrically opposed. Is it any wonder that those of us in the "trenches" are confused? I think not.

It is clear from examination of the fundamentals of TQM that many of the goals espoused by the experts are virtually a "Bill of Rights" of management theory and that these principles can be held "to be self evident". If we hold these ideals to be truly fundamental to good management then the management style that is implemented should adhere to these principles without compromise. The key is to identify the few clarifying fundamental principles and to separate them from the many confusing issues. In the words of Juran[1], "identify the vital few versus the trivial many". These "vital few" principles should then become a part of the alternative management style for quality services.

Once these underlying principles are understood (i.e. what is the true goal of Deming's point 5 or Blanchard's point 3) then a site specific variation of TQM can be developed for your university. This "Alternative Management Style" should support the underlying principles but be sensitive to the university specific environment. I believe that it is this approach of fundamental principle building and site specific adaption that will best serve the university community in the long run.

Definitions

Before expanding on the fundamental principles it is appropriate to discuss an interpretation of the meaning of the phrase "Total Quality Management" and the word "service".

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[1]Juran, J.M., Managerial Breakthrough, McGraw-Hill Book Co., 1964

Total Quality Management - The phrase as a whole has taken on a certain esoteric meaning. But a better understanding may be possible if the phrase is examined as a sum of it's parts. I would propose to start by defining the word "Total" and by defining it in two contexts. The first is the classically accepted definition that the process of total quality management will involve everyone, i.e. the total workforce. This definition is acceptable and is one of the underlying principles that is common to virtually every TQM methodology. The second context is derived from the concept that quality is not a one dimensional issue but a multi-dimensional perception of customer expectations and priorities. Since quality is multi-dimensional then management of that quality must be multi-dimensional and all encompassing, i.e. quality in it's totality.

Quality is probably the most nebulous term in the phrase. For the support service departments in a university setting I believe that a useful and simple definition is "meeting the customer's expectations". Crosby[2] defines quality as, "conformance to requirements". If we allow that the customer's expectations set the requirements then these two definitions are identical. This implies that the customer defines quality for the specific service being supplied. It also implies that different customers will have different expectations about different services. Virtually all of the TQM theories center on the customer and strongly recommend that processes need to be in place that identify the customer and the expectations of that customer for the services that are provided.

Peter Townsend in his presentation to CACUBO[3] theorized that there are two kinds of quality; "quality in fact" and "quality in perception". He went on to state that you do not have total quality unless you have quality in both. For example, you could have built the best bookshelf ever, but if the customer felt it took too long to build, then you may have quality in fact but not in perception. You may have done an excellent job of organizing the custodial staff, but if the staff is not considered responsive to customer needs, then you may perceive that you are providing quality custodial service; but there may not be quality in fact.

R. L. Lawton[4] reaffirms this concept by citing three major factors that determine quality; 1) the objective performance of the service, 2) the perception of the service and related subjective experiences, and 3) the outcome achieved by use of the service.

In common terms management implies control. Webster's New World Dictionary[5] seems to support this supposition by defining management as, "the act, art, or manner of managing, or handling, controlling, directing, etc." The word manage is defined as, "to control, guide, or work; to have charge of, direct, conduct, administer". These are the classical definitions. Many of these words that are used to explain the act of managing clearly convey the concept of controlling. This is important to remember as TQM is often characterized as changing the point of control by advocating "bottom-up communication", "inverting the pyramid", "empowering the worker" and thus, by inference, implying no "top-down management", "erosion of the pyramid", and "unempowering the manager". But the dictionary also uses such words as guide and administer. Words that are less empowering to the manager but not implying an abdication of authority.

And there's the rub! There needs to be a careful balance of "authority displacement" during the development of an alternative management style in order to ensure that middle management employees will not feel threatened by it's implementation. This fundamental principle is supported by the current literature on TQM theories as they do not advocate 100% displacement of control or authority in any one direction. They do imply that certain aspects of the management process are better provided from the top down while other aspects are better provided from the bottom up. Ken Blanchard's, "Legendary Service"[6], typifies this idea by suggesting that there are two pyramids. The conventional pyramid with management at the top providing vision, strategic planning, leadership,

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[2]Crosby, Philip B., Quality Without Tears-The Art of Hassle-Free Management, McGraw-Hill Book Co., New York, 1984

[3]Townsend, Peter, TQM Does Not Mean Timid Quality Management, presentation at CACUBO, Denver, 1991

[4]Lawton, R.L., Creating a Customer-Centered Culture, Quality Digest, September, 1991

[5] Webster's New World Dictionary of the American Language, The World Publishing Co., New York, 1968

[6]Blanchard, Ken, et al, Legendary Service, Blanchard Training and Development, Escondido, CA

and "setting the boundaries of the playing field" and the inverted pyramid where the staff controls the processes that carry out the vision and strategic plan within the boundaries of the playing field.

Service is another term that is difficult to grasp. Part of this "fuzziness" is due to the fact that the word service can be used as either a verb or a noun. When we think of the word as a noun we tend to focus on the product, i.e. the clean classroom, the repaired air handler, etc. However the end product is only one part of the entire process of providing service. When we think of the word as a verb we tend to focus on the process, i.e. engineering, purchasing, etc. Thus quality has two dimensions. An external dimension that is customer focused to ensure that the end product meets, and even surpasses customer needs, and an internal dimension that ensures that the process of delivery is as efficient as it can be and customer centered.

Why Change?

The forces that drive a for-profit company are not the same ones that drive a non-profit support service within a university. For the non-profit support service there are few incentives to be efficient, to care for the customer, to stay in business. After all, the university has been here for decades, the facilities have been here for decades, and they will be here for decades to come. The facilities have needed support services for decades and they will need support services for decades to come. It costs what it costs. Why change?

The key in the non-profit, low incentive environment is quality of worklife issues. These issues affect the very core of human values and manifest themselves in the form of an employee's desire to work in a secure and stable environment, to be respected as a person and for the knowledge and skills they possess, to participate in the decision making process, to be recognized for a job well done, to enjoy coming to work. If an alternate management style could deliver these "Bill of Rights" to the employee then they are more likely to "buy into" the duties that earn them these rights.

Peter Block[7] characterizes this approach as "enlightened self-interest" where we "define success in terms of contribution and service to customers and other departments. What we offer people as rewards are jobs that have meaning, the opportunity to learn, and create something special, and the chance to grow in a business through their own efforts."

Crosby[8] summarizes the underlying malaise.

> "Employees are turned off to the company through the normal operating practices of the organization. The thoughtless, irritating, unconcerned way they are dealt with is what does it. They feel they are pawns in the hands of uncaring functional operations."

Crosby characterizes his vision of good management practices as a "hassle-free" work environment. He compares the hassle-free company with one that is not.

> "Being an employee in a hassling company is a lot like living at home after you grow up and having your parents decide all kinds of things for you."
>
> "A "hassle" company is one in which management and employees are not on the same side. The "hassle-free" company is one in which all employees are together and there are no sides."
>
> "Hassle means that the people inside the company spend more time working on each other than they do making something happen."
>
> "Hassle-free offers pleasant working relationships, a smooth system, and happy employees."

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[7]Block, Peter, The Empowered Manager, Jossey-Bass Publishers, San Francisco, 1987

[8]Crosby, Philip B., Quality Without Tears - The Art of Hassle-free Management, McGraw-Hill Book Co., New York, 1984

Peter Block echoes these thoughts when he cites an employees lament, "We are told the organization values autonomy and [then] we are treated like children."

So why change? The reward for the employee, be they front line staff, supervisor, or middle manager is the opportunity to work in a hassle-free environment. An environment where the customer complaints are minimal because the organization is listening and responding to the customer; internal as well as external. An environment where employees have no fear of communicating in any direction, where employees are empowered to solve problems (to delight the customer), and where employees are recognized for their skills and knowledge. If the hassles of worklife are eliminated then the workforce will be more responsive and productive. This is why the employees will buy into the change!

The Six Fundamental Principles

The six fundamental principles are:

1. Customer-Centered Orientation
2. Leadership
3. Improve Communication
4. Continuous Improvement
5. Accountability
6. Quality of Worklife

Customer-Centered Orientation

Much has been said already about customer-centered orientation and there is probably no need to expand upon this a whole lot more. But there are several key points that need to be emphasized. The first issue is, "Just who is the customer?"

There are both internal and external customers. Frequently we ignore our internal customers and thus inadvertently create a hassling environment. The grounds department may be asked to dig a hole for the utility department, the design department may be asked to prepare a design for the carpenter shop, the accounting department may be asked for a project summary report by the construction department, etc. These requests should be met with the same professionalism, forthrightness, and responsiveness that is being strived for with the external customer. In most cases the internal customer has a customer who has expectations that you are helping to meet. The internal performance will have a direct bearing on the quality of service provided to the external customer. Also, respect from your peers is as important, if not more important, as respect from your external customers for establishing a strong self-image and providing quality service.

Success should be measured by how many times the customer is satisfied by the organization's response. In fact in today's environment of striving for quality it is not enough to merely satisfy the customer but it is necessary to surprise the customer by going beyond their expectations; to delight the customer. Lawton[9] notes, "Quality exists to the degree our customers are satisfied with, or excited by, our services." What does this mean to the support services organization? It means that we need to understand the true goal of a customer's request. We need to understand the underlying reasons behind the desire to seek our services. The key to moving from ordinary service to quality service is to consider the outcomes or results desired by the customers in the use of our services. This understanding can only come about by truly communicating with the customer in an attentive and caring way. Jan Carlzon, CEO of Scandinavian Airlines states it well, "In 1980 we saw every individual as a customer. In 1990 we see every customer as an individual."

So how does this apply at a university? First, know who your customers are and understand their expectations. This may be done by regular visits with Deans, Directors, Departmental Executive Officers, faculty

[9]Lawton, R.L., Creating a Customer-Centered Culture, Quality Digest, September, 1991

members or students, by using survey instruments, or by listening to what your employees are getting as feedback. Second, understand that all improvements, all changes, all processes used to deliver a service need to be designed with the customer in mind. Not with your organization in mind but with the customer in mind. Design the product or the process so that the customer's expectations are met not so that it is easier or more expedient for your organization. Third, recognize that there are many attributes to a service and different customers will have different priorities for these attributes for different services. And further, their expectations will be constantly changing. Therefore you will need to be constantly measuring and changing to adapt to the changing customer.

Lawton[10] nicely summarizes the need for customer-centered management.

> "The most advanced total quality management or service quality management methods and techniques will have limited impact until the producer-centered culture of our organizations are transformed into customer-centered cultures."

Leadership

Leadership is a key recurring theme in any of the management theories; TQM or not. However, it takes on a particularly urgent need in TQM because of the complete change of the paradigm that is required to make an alternative management style work. Juran[11], in his review of past attempts at managing quality noted that, "Personal involvement of upper managers in managing for quality has been the one element present in all successes and absent in most failures." Feigenbaum[12] states, "Quality is an ethic. Quality is a company wide process." It will take leadership in its truest form to set vision, define strategies, and supply resources in order for the customer-centered, quality improvement ethic to become the paradigm for the decision making processes that will cause continuous improvement. Juran[13] calls this "breakthrough in attitudes" and goes on to explain that it requires a "company climate for breakthrough" that can only be set with top level leadership.

Creating a vision of the future organization can be a difficult task. Peter Block identifies several reasons why leaders may have difficulty writing down a vision and why other members of the staff may have difficulty in believing that a vision statement is necessary.

> "In an implicit way, it signifies our disappointment with what exists now. To articulate our vision of the future is to come out of the closet with our doubts about the organization and the way it operates, our doubts about the way our unit serves its customers, and our doubts about the way we deal with each other inside the organization.
>
> The vision exposes the future that we wish for our unit and opens us up to potential conflict with the visions of other people. We know in our hearts that visions are not negotiable, and therefore we run the risk of conflicting visions, when we put them into words, with each other.
>
> Articulating a vision of greatness also forces us to hold ourselves accountable for acting in a way that is congruent with that vision. The vision states how we want to work with customers and users, and the vision states how we want to work with each other. Once we have created a vision and communicated it to the people around us, it becomes a benchmark for evaluating all of our actions."

The vision should include a statement of values; a clarification of what is truly important to the employee and to the organization. These values could include such things as having a family/community atmosphere at

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[10]Lawton, R.L., Creating a customer-Centered Culture, Quality Digest, September, 1991

[11]Juran, J.M., Managing for Quality, The Journal of Quality and Participation, Vol. 11, No. 1

[12]Feigenbaum, A.V., Quality: An International Imperative, The Journal of Quality and Participation, March, 1991

[13]Juran, J.M., Managerial Breakthrough-A New Concept of the Manager's Job, McGraw-Hill Book Co., New York, 1964

work, preserving our educational heritage, valuing our people and their skills and knowledge, having a safe environment to work in, having a fair environment to work in, having a stable and secure job, being part of a greater purpose, having cultural diversity in the workplace, etc. These values are then translated into a vision of the workplace which is also communicated to the organization. *For a university support service this vision may be one of an organization with a customer-centered ethic that uses participative management to create a quality work environment that continually improves while fulfilling its mission to the university.*

If there is to be some authority displacement then it will take involvement at all levels to ensure success. It is upper management's role to provide the leadership that sets the stage for this displacement to happen. There will be much fear and resistance by the middle managers who have heard that TQM means letting the workers "take over". A study in 1989 by the British Quality Association and the Institute of Personnel Management found that among 1700 firms, 91% cited resistance to change on the part of managers as the major obstacle to progress. But management does not abdicate its authority. Lawton noted that, "If there is no clear owner [of a process], there can be no easy control exerted on the process to produce what customers expect." Thus, leadership needs to ensure that during the authority displacement process ownership is not lost and that accountability is retained. This accountability is retained by the middle managers by having them provide the vision, define the strategies, and set the boundaries for the processes they "own". It will take strong leadership to define the process and to set the levels of authority displacement that are appropriate for your university.

In summary, implementation of an alternative management style for quality service will require a major cultural shift that can only occur through leadership at all levels. The ethic of placing the customer first and then designing the service around the customer will require a clear statement of values, a vision of the future, and a strategic plan for implementation that only strong leadership can provide.

Improve Communication

Traditionally we think of communication in one of two ways; internally and externally. Internally, we think of the organizational structure and the communication that occurs up and down the organizational chain. Externally we think of communication with our customers or suppliers as we receive or deliver products or services. However, there are other aspects of communication that play an important role in managing for quality. This communication involves such things as the dissemination of values that will provide guidance, education to change paradigms, training in problem solving, recognizing accomplishments, etc. All of these channels of communication are a part of an integrated whole that binds the organization together.

Vertical communication is perhaps the most difficult area to change. This change touches on the very essence of middle management's resistance to TQM concepts. There is the perception that this opening up of the vertical channel to bottom-up communication is a threat to job security. Because this is not true it is important that a strong educational program communicate the new reasons that vertical communications exist. As noted earlier, top-down communication provides vision, strategic planning, boundary setting, and problem solving while bottom-up communication provides ideas for tasks, processes, and change.

In this scenario upper and middle management does not go away. For example, in the custodial department the top-down communication might include such items as the vision of the work environment, the distribution of staff across facilities, the setting of boundaries for flexibility that will allow response to an unusual customer request, etc. The bottom-up communication could provide input on customer concerns, changes to the training curriculum, or a proposal to use a new style vacuum cleaner.

Horizontal communication also needs to be improved. Problem solving needs to occur with all the resources that have the ability to contribute. Cross-functional teams bring fresh outlooks, different paradigms, and other resources to bear on the problem. Juran[14] noted, "Major quality problems are multi-functional and require multi-functional teams for solution."

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[14]Juran, J.M., Managing for Quality, The Journal of Quality and Participation, Vol. 11, No. 1

Horizontal communication also needs to extend outside the service department. Many service departments are dependent upon other service departments in order to serve their customers. The Physical Plant can not remodel an office without buying materials through the Purchasing Department and cannot bill customers without going through the Accounting Department. Juran noted that, "the vital few problems are, with few exceptions, interdepartmental." Therefore cross-functional problem solving needs to extend beyond the immediate work unit. Cross-functional teams need to be created that include Physical Plant, Purchasing, Accounting, etc.

It can be seen that communication has to occur in a variety of ways and for a variety of reasons. Communicating vision, educating staff, and problem solving are just a few of the types of communication that must occur. Improved communication is an essential part of any management style.

Continuous Improvement

This management tenet is the core of the TQM philosophies and should be the core of any fundamentally sound management style that aspires to provide quality service. Quality service is a direct result of continuous improvement. By placing this core issue in front of everyone every day, day in and day out, and by directing it toward appropriate issues, continuous improvement will improve quality. An atmosphere of creative entrepreneurships, of innovation that is nurtured and supported at all levels, is needed. Feigenbaum[15] reaffirms this notion by stating that, "quality and innovation are mutually dependent."

Continuous improvement can occur in two ways; small incremental changes or large fundamental changes. Both types of change are necessary and need to be promoted and supported.

Small incremental improvement is the least threatening means of creating change. Small changes implies that there will be no fundamental shifts in authority, responsibilities, or organization. Small changes allow participation at the lowest levels where intuitive decision making is best carried out. Small changes will be accepted more readily and implemented with fewer resources. Small changes allow success to occur early on in the process and to obtain commitment through these early successful experiences.

The management style itself has to become one of constantly questioning, constantly evaluating, constantly tweaking; constantly making small improvements. By making every step of the process of delivering a service subject to scrutiny and improvement, quality will automatically be built in. Quality becomes an inherent part of the process; not an attribute that is dealt with separately. This is one of the reasons why Deming says we need to cease dependence upon mass inspection. Crosby[16] notes, "Quality is caused by prevention." The thousands of small corrective improvements made everyday to prevent error and to improve the final product is an important part of an alternative management style. Statistical Process Control (SPC) is one of the methodologies that can be used for implementing this type of continuous improvement.

Using the mechanism of addressing continuous improvement through small changes is an excellent way of tying the fundamentals of the alternate management style together. Leadership is needed to start the process and improved communication is needed to train the staff, identify improvements, and implement change. Accountability is needed to ensure ownership and follow through, while a quality workplace, through continuous improvement, reduces hassles and improves morale.

Juran[17] discusses the need to go farther than to just make small changes. He challenges the concept that evolutionary change can always lead to significant system improvement. He defines breakthrough as, "dynamic,

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[15]Feigenbuam, A.V., In Quality the Keyword is Total, The Journal of Quality and Participation, Vol. 11, No. 1

[16]Crosby, P.B., The Great Quality Management Mystery, The Journal of Quality and Participation, March, 1990

[17]Juran, J.M., Managerial Breakthrough-A New Concept of the Manager's Job, McGraw-Hill Book Company, New York, 1964

decisive movement to new, higher levels of performance." Service performance can be compared to a control system. In this system there are brief excursions from the setpoint (desired level of performance) but the control system brings the system back in line. Under Deming's philosophy we work to reduce the variance. However, in reality, to really improve the system the setpoint needs to be raised to an entirely different level of performance. The difference is "control versus breakthrough."; where we are not only controlling to "setpoint" through small changes to maintain quality but we are also using breakthrough analysis to make major setpoint changes. Juran summarizes this by stating that we need to, "challenge the standard as much as the variance." Controlling, by its very nature, is limiting while breakthrough is expansive.

Continuous improvement oriented management does not occur without well defined direction, training in problem solving methodologies, and constant reaffirmation of the commitment. While the other five fundamental principles are important the continuous improvement process is the core of the alternate management style and the fundamental principle around which the alternate management style is built. *Total quality is continuous improvement - Every problem is an opportunity for improvement - Every improvement is a step towards total quality.*

Accountability

Accountability is where middle-management questions the validity of some of the precepts of TQM. They ask, "How can I be held accountable if I am going to give away all of my authority to bottom-up management?" The answer is that management is still responsible for the process of service delivery but is dependent upon the staff to ensure that the process is efficient and meets the customer's needs. This is a new style of accountability. It is an accountability that is less dependent upon end-results and more dependent upon the process. Are we really concerned that every classroom is cleaned as scheduled? Or is the real question one of user satisfaction with the cleanliness of the classroom? It is an accountability that is defined by how well we have set a vision, provided strategic planning, and defined the boundaries of the playing field. It is an accountability that asks, "What have you done recently to "delight" a customer, to help a co-worker, to eliminate an unnecessary step in a process?" For many of us it is difficult to fathom this new way of being held accountable.

In managing a delivery of service the same thing applies. Know the process intimately, use the expertise of those who know the process, continuously improve the process, and there will be no need to meet a set goal as the quality of the service will automatically be built in. Therefore, our jobs as managers is to manage the process of continuous change and to be held accountable for that continuous change rather than the specific delivered service. This is one form of authority displacement.

For example, as a manager of mail service the manager should be setting a vision for the service, constantly reviewing the expectations of the customers, providing for the continuous examination of the process of mail delivery, and providing the resources to make continuous improvement. The staff of the mail service will implement the process to the best of their knowledge and ability with the resources provided. The manager will be judged by how many changes to improve the process have occurred and the staff will be judged by how well the process meets customer needs. Top-down management for vision, boundary setting, and resources and bottom-up management for implementation, continuous improvement, and customer satisfaction.

Ken Blanchard calls this seemingly perplexing oxymoron "directed autonomy." He goes on to add the additional concept of "selective disobedience." As managers we need to create that environment where employees have the freedom to move about within set boundaries but can selectively disobey a rule if the disobedience meets a higher objective. The waiter who can give away a meal without management's permission if the waiter feels it is necessary to satisfy a customer, the house keeper that can provide a complimentary room to appease a guest, or the custodian who can help a staff member clean an office are all examples of selective disobedience. Accountability? These employees are part of a team that has limited resources and they know it. They know the impact on those resources if too many meals, too many rooms, or too much time is spent outside normal duties. If vision and direction have been set, and the communication of that vision and direction has been good, accountability will be there.

Accountability is centered upon the goals and objectives that strive to fit the vision of the organization. Sometimes changing constraints and boundaries is confused with changing goals and objectives. This is frequently misinterpreted by employees as directionless management. As resource availability changes or external political, social, or economic events occur it may be necessary to modify the boundaries and set new constraints. But the key here is that the fundamental vision and underlying management principles never change.

This will become very important when nothing seems to make sense or have any consistency. The vision that you create will be the foundation to which you and your organization can return for assurance and reaffirmation. That vision must be accurately and zealously communicated with the staff so that they have the same sense of constancy and can find the strength that is needed to deal with the changing times. *Without vision there will be no constancy of purpose and without constancy of purpose there will be no stability and without stability there will be no job satisfaction and without job satisfaction there will not be a quality work environment.*

Quality of Worklife

In the public sector this issue becomes the one piece of leverage that can be used to get the staff to buy into an alternative management style. CEO of Federal Express Fred Smith said it best, "We learned a long time ago that employee satisfaction is a prerequisite to customer satisfaction." Paul Levesque[18] echoed this thought, "Positive self-image should not be thought of as a pleasant byproduct but as a prerequisite to continuous improvement." To paraphrase a movie line, "Build a quality work environment and the staff will come."

Part of the process of building a quality work environment needs to be finding out what is important to the staff and what will help to build their self esteem. What is a quality work environment as defined by your staff at your school? Is it participating in the decision making process? Is it working in a secure and stable environment? What will build self esteem? Is it to be respected as a person? Is it receiving thanks for a job well done? There are many personal values and these need to be clarified. Once these values have been identified they can become a part of a "Bill of Rights" that embodies the core values that will guide the organization in living up to its vision.

One of the ways to help an employee build self esteem is to empower them to please the customer. It is intoxicating to delight a customer. We need to create a work environment where the flexibility exits to please a customer and where it allows the employee to participate in that delight, see that customer smile, feel the warmth of success. If we accomplish that, then we will have created an environment that excites the employee. Once an employee has an opportunity to feel the excitement of self-determination while providing quality service the concern for themselves diminishes as they become part of something bigger.

Unless your organization has specifically worked to "drive out fear" there is still a barrier that inhibits communication. You may think you have a friendly environment that encourages ideas to come forth but unless the entire workforce is involved in the program and trained to participate there are still roadblocks. It is common that one or two departments have good communication between employees and management. But does that department have good communication with another department? Can the plumbing department tell the design department about a different way to design an installation? Can the design department make recommendations to the purchasing department about a different way to procure an item? In the quality work environment we are striving to achieve, these types of communication would not only occur, they would be strongly supported at all levels. This support could come in the form of training methods that teach both staff and management about teamwork and communicating in the everyday workplace or more formally through the implementation of cross-functional teams and SPC.

One of the key differences in the alternative management style is what is celebrated. No longer do we celebrate the number of classrooms cleaned properly, the dollar volume of design work completed, or the number of trees planted. Rather, we celebrate the number of process improvements made, the number of customer compliments we received, or the number of hassles we've removed from the work environment. These are the issues that now take on new meaning and significance. As the staff receives recognition for their

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[18]Levesque, Paul, Having Fun With Quality Management, Quality Digest, September, 1991

accomplishments they will strive to do more. And thus, more process improvements will occur, more compliments will be received, and more hassles will be eliminated. And then reluctant employees will see that those employees who have elected to be a part of the new quality work environment are really enjoying work. And then some of these reluctant employees will want to be a part of this new organization that they now view with some respect. And when they join in, the workforce moves up another notch in productivity. *A quality work environment creates a productive workforce - A productive workforce constantly improves - A constantly improving workforce creates a quality work environment.*

In summary, in a public institution of higher learning, where many restrictions are placed on incentives that may be used to reward employees, it is important that the development of a "Bill of Rights" be central to any alternative management style. To reiterate Peter Block's sentiment, "Success is defined in terms of contribution and service to customers and other departments. What we offer people as rewards are jobs that have meaning, the opportunity to learn, and create something special, and the chance to grow in a business through their own efforts."

The Alternative

The support services at a university are a valuable asset of the institution. During these times of limited staffing and budgets and increasing demands the support services are quite often the most responsive and creative in maintaining service while limiting the effect of these constraints upon their customers. In many cases we do some things very well and in others, not so well. How ever well we are doing, we probably agree that there is room for improvement. The suggestion being made here is that there are known formal ways of creating a culture of continuous improvement that can ensure that improvement actually does occur. It is a way of changing the process from one of "accidental" improvement to one of "structured, ensured" improvement. There is no need to "reinvent the wheel" as the methods have already been well thought out and applied with success in many cases.

Where we have failed to embrace these structured continuous improvement techniques we have used the excuses of, "We don't have the resources!", "We don't have the time!", "We don't have the right type of people!", "It's just another fad!", "That's fine for profit-driven private industry but it will never work at a public institution!". What I can't believe is that we want to continue working in an environment where we are constantly struggling to just get the work done, in a hassling workplace, under a constant barrage of criticism and threats, with no end in sight. There is an alternative. I believe that alternative is reached by creating a vision that promises relief from this difficult work environment and by putting into place a formal methodology that shows everybody we are serious about moving towards that vision; thus making the Physical Plant a place that is rewarding and worth dedicating a lifetime of effort.

Managing by the Seat of Your Pants: Vision, Innovation, and Creativity

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"Managing by the Seat of your Pants". Is a description of a management concept which has had equally positive as well as negative connotations. From the "gun slinging manager" who "thinks on his feet", to the "fly by night" "spur of the moment" manager who doesn't plan.

During the past two decades, management style has evolved not only in the business community but also in the human environment. The analytical leaders who laid the foundation for management are now not only being asked to find new and innovative ways to serve their clients, and to be sensitive to employees' needs, as well as to meet the immediate requirements of daily operation, research and teaching.

The change from analytical deductive management, a left brain function, to intuitive inductive management, a right brain heart-based function is the focus of this presentation.

We will examine the differences between the two styles of management and problem solving, with examples pertinent to today's business leaders. Trends in developing the skills required to manage future organizations will be discussed, as well as the way in which the intuitive problem-solving approach can be combined with an analytical approach to develop an integrated management style appropriate to the working environment.

We will review examples of how creating with the right brain and analyzing with the left can not only lead to superior decision-making, but also bring together the various employee skills to create a department which can maintain buildings and be responsive to the multifarious demands of research and teaching.

Functions of Left Brain and Right Brain

The intuitive right brain, which may opt for "seat of the pants management", interferes with the left brain which may decide on analytical leadership. The opposing styles are in constant conflict to see who is boss. Let us first look at the functioning of the two hemispheres of the brain. Psychologists, neurologists, and neurosurgeons, such as Dr. Wilder Penfield, have shown that the brain's two hemispheres have very distinct functions. The basic research demonstrated that the left hemisphere controls the movements of the right side of the body and the right hemisphere controls the movements of the left side. Recently, researchers have shown more fundamental differences.

The left hemisphere has been found to be our human computer. Information is stored and processed logically, congruently, and convergently in this area of the brain. Memory storage and its analytical processing, logic, writing and language processing, are the functions of the left hemisphere. People who are left brain dominant are sometimes called calculators or bean counters. The understanding of happy situations is processed here in the left hemisphere.

In contrast, the right brain reveals the artistic, visionary, musical, fantasy and hemisphere, which visualizes spacial relationships and provides understanding of unhappy events. It is non-directed, solves divergent problems, specializes in simultaneous processing, and stores images, sounds, and smells in memory.

The tools of the right brain are intuition, perceptive feelings, creativity and emotions. The artist, the poet, and most left-handed people, are said to be right hemisphere dominant.

Intuition

The late business philosopher and designer of the geodesic dome, Buckminster Fuller called intuition "cosmic fishing". He warned "Once you feel a nibble, you've got to hook the fish." Too many people, he said, "get a hunch, then light up a

cigarette and forget about it." How many hunches do each of us lose?[2]

The gaining of knowledge by the non-rational use of all thoughts and memories stored in both hemispheres of the brain has been studied and loosely defined as "divergent thinking." Divergent thinking is loosely organized, only partially directed, and unconventional.[3]

Jean Pierre Petolas of Concordia University, former Vice-Principal of Physical Resources, struggling under an enormous student population in a downtown campus, rented a car from Tilden. Looking at the building which housed Tilden, he didn't see a garage - he visualized a Fine Arts Faculty, which is what it is today. Not being able to articulate that itch, that hazy unclear subliminal impression, doesn't mean that it surfaced by accident.

The years of experience, positive and negative, emotions, relationships and unrelated facts create uncharted paths to the future. Intuition compresses all these factors and experiences into a flash, a butterfly that flutters by in an instant. The person seen as intuitive is the one who has his/her net ready and catches that butterfly.

Styles of Management

The successful balancing act between analytical deductive management, a left brain function, and intuitive inductive management, a right brain function, is a critical factor in Physical Plant management.

We will examine the differences between the two styles of management and problem-solving, with examples pertinent to Physical Plant. The intuitive problem-solving approach can be combined with an analytical method to develop an integrated management style appropriate to the Physical Plant environment.

The first style of management is the analytical and quantifiable, it is a left brain approach. This style employs techniques such as management by objective (MBO), program evaluation and review technique (PERT), and forecasting to make management decisions. Structured environments and staff promotion based upon rational and logical methods of reasoning has created mediocre safe and sensible organizations. Many CEO's and Senior Managers remember the free-wheeling and exciting things which occured at the inception of departments and companies. The growth which ensued formed companies such as General Motors, government bureaucracies and government funded universities which tended to emulate the government. This tendency is supported by the proliferation of Harvard Business

School graduates among others in top private and public management positions.

The second management style uses right brain skills. This style is much less supported by business schools, and is similar to the collegial problem solving of the academic research sector of universities. "Quality Circles," "Total Quality Management," "Skunk Works", and "Kizam" are all examples of the use and release of creativity and intuition to create innovative solutions to problems. Problems are evaluated globally and quickly often with inadequate information and figures. Bureaucracy is side-stepped or ignored by individuals and teams infatuated with an idea. The innovations in the global economy such as Sony, Walt Disney, and a myriad of small companies that foster non-structured spontaneous involvement have shown success in the market place.

The third style of management is called integrated management. This style attempts to use the right and left brain in unison. Henry Mintzberg, in an article entitled "Planning on the Left Side and Managing on the Right," published by the Harvard Business Review in 1976, hypothesized "the important policy processes of managing of an operation rely to a considerable extent on the faculties identified with the brain's right hemisphere. Effective managers seem to revel in ambiguity, in complex, mysterious systems with relatively little order".[4]

According to Mintzberg, the Bronfman Professor of Management at McGill, the CEO merely pays lip service to systematic long-range planning, elaborate organigrams and reliance on computers and esoteric quantitative techniques. In reality, he's a "holistic intuitive thinker who revels in a climate of calculated chaos." Mintzberg portrays the CEO as working at a frantic pace, switching from topic to topic, making decisions in ten minutes or less, and "constantly relying on hunches to cope with problems far too complex for rational analysis." The four stages of intuitive management as described by Mintzberg, are: preparation ("creativity favors the prepared mind"); incubation ("letting the subconscious do the work"); illumination ("waking up in the middle of the night and shouting, «Eureka, I've got it!»"); and verification ("then working it all out linearly").[5]

Intuitiveness in Physical Plant

Drawing from Mintzberg's four stages of intuitive management, and relating them to the real life management of Physical Plant, I would like to create for you a vision of the excitement I have found in my work.

Preparation

Edgar Bronfman, Seagram's CEO says: "When you're up to your neck in alligators, it's easy to forget that you started out to drain the swamp".[6]

In Physical Plant, with an overload of decaying building fabric and budget inadequacy, "firefighting" has become an all consuming, self-justifying way of life. When is the last time you had enough time to reflect upon your university goals and objectives and to judge "the goodness of fit" of your department? Captives of client service, with open-door policies, few physical plant staff have "time". Flying by the seat of their pants in day-to-day decision-making, physical plant management finds that it is "flying blind". To have fun and use intuition, a manager must first prepare. Are your goals and objectives in a place where you can see them each day? Do you make time for your mind to wander randomly over all the activities in which you are involved? Do you have time to read and muse over the future? If your answer to these is that "I'm too busy, I don't have time", then today's gift to you will be a new lease on life. First, take a page in your agenda, mark it "NOTHINGNESS" and keep it by your side for one week, 24 hours per day, with a pen or pencil attached. Whenever you have an idea, a good feeling or a spark, write it down, day or night. Then give yourself a gift, once per week on your agenda, mark one hour - "MY TIME". Dr. Penfield's research into memory in the 1960's proved that our minds never forget. We may well misfile information but we never loose the feeling, the fact, and the idea. Your time will be the time that the ideas written down will come together, the intuitive impression from visceral learning will rise above the mental noise of physical plant life.

Incubation

Our normal manner of success in physical plant is to define a problem, look at alternative solutions, pick the best solution and implement it as fast as possible, then go on to the next problem. More normally, we will be working at two or three dozen problems at the same time. The idea of allowing solutions to be released from schedules and deadlines is not part of our North American heritage. As Yoga scholar Ramamurthi has said "all paths converge toward the ultimate goal".[7] Where we start is less significant than our vision of the future. The idea diary and the "my hour" are two pacing tools that allows ideals and feelings to blend. Relaxing and letting the mind wander in another direction allows freedom to find the answer to a problem. Scottish bacteriologist Alexander Fleming, while conducting experiments with bacteria, noticed that some colonies died due to contaminated petri dishes. Logic would

dictate to throwing them away and starting afresh. Instead, Fleming had an intuitive gut feeling that this was not a mistake. He pursued his hunch and discovered penicillin.

Confuscus, the Chinese philosopher has said that we are only limited because we believe we are limited. Are you ready to believe that a flash of inspiration may come at any moment? Can you train yourself to write it on your "NOTHINGNESS" page? Dr. Maxell Maltz in Psycho-Cybernetics wrote "you must learn to trust your creative mechanism to do its work and not jam it by becoming too concerned or too anxious as to whether it will work or not, or by attempting to force it by too much conscious effort. You must let it work, rather than make it work." Simply, as Dr. Jonas Salk, the discoverer of polio vaccine stated that intuition will tell the thinking mind where to look next".

Norman Berthiaume, former director of Physical Plant at the University of Ottawa many years ago started with a problem of high energy costs and sought a solution to reduce them. Over the years, the solution grew from abandoning hi-pressure boilers to district heating, co-generation, and condensating boilers. This had moved a long way from the original concept.

Robert Frost in his poem "The Road Not Taken" noted that there are choices: "two roads diverged in a wood, and I took the one less travelled by, and that has made all the difference."

Illuminations

How many of us are lucky enough to see the stars in the eyes of one or more of our employees who have brought forward a new idea. What a joy it is for a director to see that spark and to help keep it burning. "Did you know we can keep pigeons off our buildings by hanging mock owls". Carmen Spataro, Manager, Campus Services came in one day - "I bought five". "Let's try it" I said. It worked! "Eureka!"

The joy of a two year old with a lollipop - the joy of life. "Eureka" "I have found it".

Logic and analysis can lead a person only part way down a converging path to a solution. I have yet to see an accountant or an MBAer excited over an analytical decision. Dare to take one hour per week for yourself. Relax and allow yourself to accept that flash as a positive validation of your future.

Verification

Some people are impulsive in solving problems; they act on the basis of the first solution that comes to mind with little consideration for its adequacy. Others are reflective, thinking about many possible solutions, evaluating alternatives, censoring their ideas weighing the products of their thinking until the idea, like a spark is extinguished. In Mintzberg's final stage of intuitive management, verification, the left brain skills are used to test logically and linearly the ideas and solutions which have been caught as butterflies. As Einhorn and Hogarth in the Harvard Business Review of February 1937 in "Decision making going forward in reverse" stated: "Although managers use both types of thinking (intuitive, and logic) all the time they are often unaware of the differences. Moreover this lack of awareness makes decision makers stumble into mental traps that yield bad decisions. By understanding, thinking backwords and forwards, we can recognize these traps and improve our decisions".[10]

Accepting that mental traps, are part of the baggage we carry, we can emphasize our intuitive skills and put the baggage where it belongs - in the garbage.

FOOTNOTES

[1]Lahey, B.B., Psychology, An Introduction. Dubuque, IA: William C. Brown Publishers, (1989) pp. 56-65.

[2]Agor W.H., Intuitive Management. New York: Prentice Hall Press, (1986) pp. 11.

[3]Guilford, J.P., The Nature of Human Intelligence. New York: McGraw Hill, (1967).

[4]Mintzberg, Henry, "Planning on the Left Side and Managing on the Right". Harvard Business Review, (July/August 1976) pp. 53.

[5]IBID pp. 54-58.

[6]Rowan Roy, The Intuitive Manager. Boston: Little, Brown & Company (Canada) Ltd., (1986) pp. 39.

[7]Ibid. pp. 82

[8]Ibid. pp. 86

[9]Bennet, C.L. & Pierce, L, Argosy to Adventure. Toronto: Ryerson Press and the MacMillan Company of Canada Ltd., (1959) pp. 122, 123.

[10]Einhorn H.J. & Hogarth R.M., "Decision making: going forward in reverse". Harvard Business Review, (January - February 1987) pp. 66.

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Understanding Cross-Cultural Issues in the Workplace

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Introduction

Although studies vary regarding the percentage of minority populations which will be present in our work force in the future it is clear that all of us will find ourselves supervising members of one minority group or another. In the not distant future women and minorities are going to emerge as the majority in the work place and in leadership roles. This presentation will explore our own awareness of and attitudes related to minority populations and suggest that our attitudes today may not suffice. Men and women frequently do not understand each other; ethnic and sex minorities in the work place cry discrimination and we stand, wondering what we did that was unusual or unacceptable. Because we only have an hour we will be painting a broad picture, at times making generalizations that may not hold in all cases. As much as possible I will try to avoid stereotyping, which is so easily done when attempting such a broad subject in such a short time.

This presentation will not deal with the legal ramifications of our actions or inactions. Rather, we will discuss the differences in values and psychological make-up, helping us understand where these differences are based and how to effectively use these differences for the success of our work place.

Handout "A" is a list of words and definitions. I recommend that you read these at your leisure as we often use these terms inappropriately. Some also have specific definitions when we are talking about minority issues. One, in particular, I would like to address at the beginning of my presentation--"minority." How often have you heard people complain that "women," who constitute at least half of the population, are not a minority group. Or that Mexican-Americans are not a minority group in several areas of the southwest. If we use numbers as our definition our assumption may be correct. But minority group status has a broader definition. Corey et al. (1988) defines minority group as "a category of people who have typically been discriminated against or subjected to unequal treatment. These groups have been characterized as subordinate, dominated and powerless." Using this definition "minority" can apply to women, persons who are homosexuals, persons with physical or mental impairments, racial and ethnic groups.

Everyone has prejudices. Each has grown up in a culture and in an ethnic community that held beliefs, values, and behaviors that it considered appropriate. A particular group may have considered itself superior to others, or it may have had to fight and work for status that was comparable to the dominant culture. Or another group may have just had to think they were better than someone because they were close to the bottom of the social or economic ladder. And the majority of people react negatively to what they don't understand or what appears different. It is important to know what one's prejudices are so that these prejudices do not translate into prejudiced behavior.

The danger we all face is cultural encapsulation. This is substituting our model stereotypes for the real world. We disregard culture variations in a dogmatic adherence to some universal notion of the truth. We assume that our own beliefs, values, behaviors and structures are superior and that other ways of believing, valuing, behaving, or social structures are inferior. Others who want to "make it" must adopt "our way" in order to be healthy and successful.

Being open to the values and beliefs of others, acknowledging that their way may be more effective or successful than our way, or that their way may be different but just as effective, and so allowing and encouraging their creativity, is required if we are going to respect the dignity, integrity and uniqueness of others.

Let's look at one aspect of understanding the impact of a minority member's journey in assimilating into the dominant culture, and becoming part of that culture in a way that respects his/her own cultural giftedness. This model is found in Derald Wing Sue and David Sue's Counseling the Culturally Different

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(1990).

Racial/Cultural Identity Development Model

The authors suggest there are five stages in the Racial/Cultural Identity Development Model. The model defines the stages that oppressed people experience as they struggle to understand themselves in terms of their own culture, the dominant culture, and the oppressive relationship between the two. The five stages are (1) the conformity stage; (2) the dissonance stage; (3) the resistance/immersion stage; (4) the introspective stage and (5) the integration stage.

In exploring these fives stages we will look at four questions that help us identify a person's present stage. (1) How does the person feel about him/herself? (2) How does the person feel about his/her own minority group? (3) How does he/she feel about others of different minority groups? (4) How does he/she feel about the dominant culture?

STAGE ONE: CONFORMITY

Let us look at Stage One, the conformity stage. During this stage minority persons appreciate and prefer the dominant culture's values over their own, and they try to become part of the dominant culture quickly. They depreciate or devalue themselves and try to get rid of or temper as much as possible any characteristics that are associated with their own culture. They also depreciate others of their minority group and tend to discriminate against other minority groups who they basically see as bad and who may either be competing with them to become "white" or who may accentuate the differences that exist. Malcolm X related how he tried desperately to appear as white as possible, straightening and dyeing his hair, dressing in suits, and modifying his speech, in order to appear as much as possible as a white male. He also only dated white women. Other individuals try to get rid of accents, and other characteristics, to avoid appearing different. There is a strong notion of self-hatred in these actions. There is a tendency to take on the beliefs and attitudes of the dominant culture during this stage. So if those around me hate blacks, and I'm black, I will also tend to take a negative view of blacks.

In looking at the four aspects of Stage One, Conformity, we see that a person in this stage depreciates himself, depreciates others of his own minority group, depreciates members of other minority groups and appreciates the dominant culture. How will these attitudes impact his work? First, an individual will be reticent to share any skills or insights that might be different or creative for fear that it will not please or be acceptable to the supervisor. Secondly, an individual might be particularly

intolerant of members of his own or other minority groups, distancing himself by being critical, impatient, or accepting stereotyping as appropriate. Thirdly, the individual might enforce policies or guidelines rigidly as a way of appearing to follow the "party line."

Let's apply these in the work place by describing some concrete examples.

> Jesse appears particularly intolerant of his fellow workers, who, like him, are Hispanic. He perceives and treats them as if they are lazy, irresponsible, and stupid. He is described by his peers as critical and hostile and most do not like working with him. This is fine with Jesse because he prefers working alone so that he can do "quality" work. Because he is responsible and does good work Jesse would be a good candidate for promotion to supervisor but he is denied the opportunity because of his attitude. As his supervisor you know Jesse has poor self-esteem and you see that his attitude towards his own minority group is unacceptable. It would be quite reasonable to assume that if other minority groups were on the staff Jesse would have difficulties with them as well.

> Carla often says, "I hate working for a woman." Could this reflect her experience of the harshness of non-acceptance on the part of the woman supervisor who is in stage one? Or, if Carla struggles with believing that women ought not be in leadership roles, is it her rejection of the assimilation process into the white male dominant culture?

What are some of the implications of this for supervision? Minority persons in this stage may be very prejudiced against their own group or other minority groups.

> Juan, a supervisor, demanded more, criticized more, was abusive towards, and would not recommend for promotion, any members of his own or other minority groups. He did not "like working with" certain people, usually those of his own ethnicity. When his employees came to him with suggestions he usually brushed them off and was particularly "put off" when the suggestions came from an assertive Hispanic female. He told his supervisor that she was questioning his authority, trying to make him/her look bad, not respecting

his position.

Or a minority person, trying to please his dominant cultured supervisor, may not share his best thinking or values for fear that it will not be accepted. A supervisor, not aware of his own prejudice may reward the employee's behavior--"He's not like the rest. He's going to go places. Lets give him more opportunities or training to facilitate his growth (toward whiteness)."

STAGE TWO: DISSONANCE

Stage Two is the Dissonance Stage. In this stage the minority person encounters information or experiences inconsistent with his previously held cultural beliefs, attitudes and values. People generally move into this stage slowly. They may begin to wonder about the fairness of the dominant culture. They may grow suspicious and distrust certain members of the dominant group, e.g., their supervisor, or a white employee who questions their authority. Or a woman may come to the "glass ceiling" and experience the reality that even though she faithfully played according to the white male rules, she will not be promoted to a higher position. Although people usually move into this stage slowly a traumatic event may propel some individuals to move at a rapid pace. For many African-Americans the assassination of Martin Luther King had this affect. Being denied a clearly earned promotion or seeing clear and blatant prejudice may impact an individual in a way that raises internal conflicts that cause discomfort. A gay man, who has denied, or at least has not openly admitted, his sexual orientation, may find the AIDS crisis propelling him to action. At times people struggling with this stage will be seen as inconsistent. Often they don't quite know what they are feeling or how they perceive themselves or others. This is a stage of sorting out and trying to relieve the pain of the dissonance. Feelings about themselves, their own minority group, other minority groups and the dominant culture are mixed. It is a time of internal conflict.

In this stage an individual may focus on one member of the dominant group rather than face the reality that the dominant system oppresses them. She might say, "It's the personnel director who is oppressive." Or "The director of student services treats me like a slave." She is not ready to say, "There is something wrong with the system. The system is oppressive and must be changed." At this point that may appear far too threatening.

In reflecting on the value of her own minority culture an Asian-American, who believes that Asians are inhibited, passive and inarticulate, encounters a female Asian leader who breaks the stereotype. She suddenly wonders if this woman is an exception

or if perhaps she herself had simply accepted what everybody thought about Asian-Americans. There may not be certainty, just questions and some confusion. Or a Hispanic, meeting someone proud of his cultural heritage and actively encouraging the university to celebrate Fiesta, wonders if the sense of celebration is acceptable. An African-American, who may have deceived himself into believing that race problems are due to laziness, or other personal inadequacies, suddenly encounters racism on a personal level. Denial begins to break down.

In this stage an individual is in conflict between being self-depreciating and appreciating. The same feelings are present as he considers members of his own minority group. Feelings of shame and pride are mixed in the individual and a sense of conflict develops. Although these same appreciating and depreciating feelings may also be present towards other minority groups usually not much psychic energy is expended here. The conflict between valuing and de-valuing also applies to the dominant culture.

STAGE THREE: RESISTANCE AND IMMERSION

The third stage is resistance and immersion. This stage is quite evident. The individual rejects the dominant culture's values and beliefs and accepts, usually uncritically, his/her own culture's values and beliefs. The hair style and clothes, the religion, the way of speaking, the time orientation, the authority structure, of the minority person's culture become the norm. Malcolm X clearly exemplified this when he started his Black Panther group. Many gay men and lesbian women have found that immersing themselves in a like community has helped them accept and prize themselves and given them a forum for action. Some educational and employment communities have groups of African-American students, or Hispanic employees, or professional women. Often these are attempts to learn about and take pride in their identity.

During this resistance and immersion stage the three most active feelings are guilt, shame and anger. There is guilt and shame about having "sold out" in the past and there is anger at the oppression and the sense of having been brainwashed.

> Luther, an African-American carpenter, has been belligerent of late. He always has a chip on his shoulder and acts like his supervisor is picking on him. It doesn't seem to matter what the supervisor does. He claims he is overlooked at promotion time, gets the dirty jobs, and receives undeserved poor performance reviews. He says it's because his supervisor is afraid of him, that he doesn't like Black brothers. The truth

is, Luther is rather aggressive and he speaks with feeling about things. He clearly takes a stand and seems overly committed to his way of doing things. Luther says his supervisor doesn't want to commit himself to anything, that he sells out to the system. Eventually Luther is fired for having a negative and hostile attitude.

It is not unusual for African-Americans to speak passionately about issues and to see an Anglo as wishy-washy, too interested in compromising the truth. Most African-Americans do not appreciate being told to "calm down." Calming down can easily mean "don't feel" or don't stay committed to your point of view. For African-Americans, speaking with feeling or even passion, is considered being honest; speaking loudly may not be anger but passion. African-Americans are not as reticent to bring conflict into the public forum as some others. Therefore, they might confront their supervisor in public, not intending it to be a sign of disrespect.

It is also common for individuals in the resistance and immersion stage to see discrimination everywhere. And this can actually be growth. For a person who is oppressed by the system to deny such oppression is not helpful to their personal growth or to the assimilation process. When minorities have long histories of having been discriminated against they will be suspicious and fearful. It is appropriate. It is facing reality.

In this stage the individual will be self-appreciating and will appreciate his/her own minority group, usually without discrimination or any self-criticism. There will be some sensitivity to the common plight shared with other minority groups, although the person can become so centered in appreciating their own culture that they may exhibit prejudice against others. There is a clear tendency to depreciate the dominant culture which is experienced as oppressive.

For a supervisor this stage can be particularly difficult. It is critical that the supervisor understand as much as possible about the values, beliefs and attitudes of the minority culture so that behaviors are not misunderstood or taken as a personal affront. It is also helpful for the supervisor to acknowledge the oppressive nature of the dominant system and help work for change. It is clear that work must progress, quality be maintained and a spirit of cooperation built. But where minority views and values can contribute, where reasonable exceptions can be made, and where anger and pain can be shared, all move forward to a more equitable and productive environment.

STAGE FOUR: INTROSPECTION

The fourth stage is introspection. Individuals begin to ask questions about their own values and those of the dominant culture. Frequently they develop an interest in and empathy for other ethnic or racial groups.

> Juan had been leading the cause of the Hispanics in the work force for several years. He had fought to have a translator hired full time to help in the hiring and supervising of employees. He had pushed for the hiring of more Hispanics. He had lobbied for certain holidays that were important to the Hispanic community. He had even gotten the personnel office to offer a training seminar on Hispanic values. But he was tired. He felt psychologically drained. He had also lost some enthusiasm for leading the fight. Now, while he appreciates his own culture and people, he no longer holds in reverence, nor does he hold in contempt, the dominant culture. He has grown to value the contributions and needs of the African-Americans and American-Indians on campus. He continues to discern and speak out on unacceptable policies but he is not so angry.

In the introspective stage an individual is concerned with the basis of self-appreciation, and with the nature of the unequivocal appreciation he had of his own minority group in the previous stage. What is it that makes me, and my minority group, worthwhile? What are the problems and difficulties that we have? How have I judged other minority groups? What was the basis of my judgement? And what was the basis for totally rejecting or depreciating the dominant culture?

In this stage the supervisor can learn a great deal from an employee. The questions that he or she poses are probably important for the work place and important questions for the supervisor to study.

STAGE FIVE: INTEGRATION

The fifth stage is integration. Persons in this group have grown to appreciate themselves, their own culture, the culture of others and the dominant culture. There is a sense of security, and an appreciation of the uniqueness of oneself and others. This person has a strong commitment and desire to eliminate all forms of oppression, wherever they are found. The person is selective about which values, beliefs and attitudes will form his/her life. And various racial and ethnic groups might have contributed to the person's life style.

The person begins to comfortably incorporate his/her own values. They may be able to speak of their values and seek appropriate ways in incorporate their own values into the environment that is dominated by another group.

> James Running Bear is a good worker but he frequently is late for work. He more often than not stays late to finish a project. As often as the supervisor has brought this to his attention he says to leave a project unfinished is not right. He says he more than gives the job forty hours a week. The supervisor agrees with this assessment. One of the values of the American Indian community is to be present-oriented and to finish projects before going on to the next project or activity. Things get done according to a rational order, not according to deadlines.
>
> James Running Bear is also very knowledgeable about his work. He frequently teaches other workers skills and works well on a team. But he does not speak up at meetings and he shuns praise or recognition. He appears embarrassed if asked to come forward. He sees such recognition as being singled out, given credit or praise and placed above his peers. One of the values associated with American Indians is a devaluing of competition. They value cooperation and team effort and avoid discord and disharmony. Individual achievement and competition are discouraged.
>
> James Running Bear isn't militant or belligerent in his actions. He simply seeks the best of both worlds, his and that of the dominant culture. The astute supervisor recognizes this and works with James to let it happen.

Control/Responsibility

In each one of these five stages there is a two pronged question. Who has the control and who has the responsibility? Clearly when one is in stage one--conformity--the dominant culture has the control. They set the standards and their values and attitudes rule. The minority person, however, has all the responsibility. It is their responsibility to figure out what the rules are and to follow them precisely.

In stage two--dissonance--external control, internal responsibility is still strong but it is colored by doubts of

one's internal responsibility. This contributes to the confusion experienced in this stage. "Because of the system I can follow the external rules and still not win." At this point I struggle with understanding.

In stage three--resistance and immersion--a major shift happens. Now the minority person sees himself controlled by external forces and no longer assumes responsibility for his fate. The system is responsible, the system controls his destiny. Political systems, racism, sexism, or even chance, control what happens. There is little one can do to control one's fate. People in this stage may acknowledge and seemingly accept the recommendations of authority figures, but then not follow through with them. The resistance is often experienced in the work place as apathy, placating behavior or learned helplessness. These usually are conscious, or unconscious, expressions of anger.

In stage four--introspection, and stage five, integration--individuals will frequently have a sense of internal control and external responsibility. There is a sense that an individual can control his or her own life if society will allow. But there is also an awareness of external barriers which can block personal attainment. Internal control and external responsibility are the basis for much of the affirmative action planning. The dominant culture, with a long and embedded history of discrimination, requires an aggressive policy that can overcome the results of this long history. If it is not restrained, oppression, even if unconscious, will continue.

The last option is internal control and internal responsibility. The dominant culture identifies deeply with this concept and finds it difficult to see the others. This makes it easier to deny that prejudice and racism exist and fosters the idea that anyone can make good if they'll just try hard enough. Unfortunately, it is not the truth.

Some Ethnic Traits

There are certain characteristics of many cultures that we can come to understand and appreciate. Although it is difficult to avoid stereotyping we can generally say that African-Americans value both their men and women being strong and able to survive, church is seen as a place to express sadness, success is stressed in the home, and conflicts are not covered up. Conflicts are often settled in public. This is true in the work place as well. African-Americans are also more attuned to non-verbal communication. They will trust much more what they see than what they hear. A supervisor who promises to think about the concern of a black employee, while at the same placing the memo on a pile of paper that never gets reviewed, has clearly sent a message

that is not missed. African-Americans tend to be oriented more to the present than to the past or future.

Asian-Americans place a great deal of emphasis on success, respect older people and their wisdom, and are greatly distressed over losing face. There is a strong sense that one must be careful about what one says because it can never be taken back. Asian-Americans may value silence. Often, talkative people are thought to be seeking attention. Emotional expression is a sign of immaturity and one strives for emotional restraint as a sign of maturity. The family is very important.

American Indians value sharing and giving, based on the belief that everything really belongs to the earth anyway and is not their own personal property. Cooperation, noninterference with others, observing rather than reacting impulsively, being present-oriented and living in the here and now, are highly valued. American Indians value harmony with nature and have a strong sense of family orientation, respecting elders' wisdom and caring for relatives. Direct eye contact with an elder or person in authority is considered a sign of disrespect.

Conclusion

In this presentation we have explored the minority person's experience of the assimilation process. But each supervisor or dominant group member also goes through a similar process. Examining how I, as a member of the dominant culture, feel about my own values, attitudes and beliefs, will reveal my openness to others. If I am culturally encapsulated, i.e., view everything from my preconceived stereotypes, I will likely garner hostility, poor cooperation, placating behavior, sabotaging efforts and other passive-aggressive behaviors. As I struggle with my attempts to be open, to see value in others' experiences and knowledge; as I grapple with trying to modify the system so that it is more fair, and run into walls of resistance and oppression I, too, may feel the anger and disappointment experienced by my employees. That anger and disappointment may cause me to become bitter and leave the oppressive system. Or, in order to avoid the internal pain, I might decide the dominant oppressive system is just the way things are and give up and go along. Then my part of the oppression is no longer unconscious, as it was before I began this venture. It becomes conscious and is my way of avoiding taking a stand and enduring the pain. But if I can see and stand with the oppressed, I, too, can grow towards stage five--integration--and appreciation of all of my employees. And, at the same time, my life can be enriched. Most of us never arrive fully at this place, but as long as we honesty strive to this goal our employees will respect us and our efforts.

Every manager or supervisor probably cannot be knowledgeable

about every culture. But each can begin to listen, to ask questions, to discern, "What is this person's point of view? What is the value behind their statement? Who do they perceive is in control? Who do they perceive is responsible?"

Is this person conforming in order to please me? If this person is in stage one, conformity, how can I affirm his uniqueness and help him value himself and the culture from which he comes?

Is this person in stage two, feeling dissonance or conflict about her own value as a person and that of her group? Is this person wondering if the dominant culture really is fair and responsible? How can I ask questions, affirm as appropriate, criticize where necessary, without judging or stereotyping? How can I acknowledge and work for change?

Is this person in stage three, resistance and immersion? How can I be present to anger and hurt without wanting to judge and strike back? How can I listen, even when I disagree, and affirm that the person has a point? Can I risk admitting that I may have been part of an oppressive system and may still be participating out of my own ignorance? Am I willing to do something about changing myself as well as the system?

Is this person in stage four, introspection, or stage five, integration? What can I learn about myself and members of other groups from these individuals who have walked a difficult journey? How can they be of help to me, to other supervisors, or to other employees as we strive to learn more about working and living together?

We can learn, be enriched by and celebrate the uniqueness of our own work force and work community. Our work can be more comfortable and more efficient for all concerned. And we can model a community of caring people who have learned to work together with a sense of pride and appreciation.

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Appendix A

Cultural encapsulation: substituting model stereotypes for the real world; disregard cultural variations in a dogmatic adherence to some universal notion of the truth.

Culture: shared beliefs, values, thought patterns, feelings and behaviors which are conditioned by such things as ethnicity, gender, age, socioeconomic status and life-style.

Ethnicity: grouped sociologically--share some geographical place of origin, shared similar experiences, based on cultural values

Minority: category of people who have typically been discriminated against or subjected to unequal treatment. characterized as subordinate, dominated and powerless.

Prejudice: a preconceived preference for or bias against a particular group based on irrational suspicions, hatred, or lack of knowledge/information.

Race: biological term for transmitted traits--Three races:

Negroid--African American, Jamaican, Haitian, Caribbean Blacks--(skin color pigmented by melanoid, physical structure includes different hair texture, larger nose and lips, hip structures, etc.)

Caucasoid: Italians, Irish, Mexican, etc.--(light skin, smaller nose, thinner skin, hair long and thin)

Mongoloid: Chinese, Korean, Asian Indians, Japanese--(yellow skin, thin nose, almond shaped eyes)

Racism: Individual, institutional or cultural

individual racism: characterized by belief in white supremacy; racial jokes, use of slang racial labels designed to hurt;

institutional racism: related to police practices, inadequate education, discrimination in justice system, , etc.

cultural racism: related to belief, feeling, behaviors of one cultural group that asserts their superiority in their accomplishments, achievement and creativity over those of other groups; includes language, education system, medicine, science, religion, law and politics, economics, art, music, theatre.

Drugs in the Workplace: An Ounce of Prevention

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INCREASED PUBLIC AWARENESS

The late 1980's have seen unprecedented growth in awareness and concern over drug use and its toll on the health and productivity of Americans. In the last several years, this increase in interest has been fueled in part by societal perceptions. Dramatic incidents of drug related violence and death-witness the deaths of sports celebrities Len Bias and Don Rogers, the sudden and widespread emergence of "crack" cocaine, and the record-breaking murder rate in our nation's capital - shape public opinion in powerful ways. There have also been striking examples of drug-related workplace disasters. In 1989, the captain of the oil tanker Valdez that ran aground off the Alaskan coastline, causing the largest oil spill in American history, had a blood alcohol level in excess of legal limits. In 1987, in Chase Maryland, a Conrail engineer admitted smoking marijuana just before his train was involved in a collision with an Amtrak train which resulted in 16 deaths and scores of injuries.

Indeed several public polls have found that drugs are perceived as the number one problems facing the United States. Workplace-related drug use and its consequences are obviously important components of this problem, and the workplace has immense potential as the focal point of significant activities to decrease drug use and its adverse consequences (Walsh and Gust, 1989.).

The problems caused by drug impairment in the workplace are not limited to the railroad industry, or to any particular group of industries. A recent Bureau of Labor Statistics survey of employers that test their

employees and applicants for drugs showed some startling results: of the estimated 950,000 current employees tested under a variety of circumstances, 8.8 percent tested positive; of the nearly four million applicants tested, 11.9 percent tested positive. While these are only statistical projections, they nonetheless paint a frightening picture. According to National Institute on Drug Abuse statistics, 20 percent of all workers in the United States use drugs or alcohol in the workplace, and 10 percent abuse drugs and alcohol in the workplace. It costs companies approximately $7,000 per year per disabled employee in testing and rehabilitation. Obviously, there are other costs associated with drugs in the workplace. It is estimated that the cost of drug abuse in the workplace to our nation's employers is $75 - $100 Billion per year in lost productivity, absenteeism, turnover, and medical expenses.

There has been an important public and private sector response to these concerns reflected in a two-pronged approach to reduce the supply of and the demand for drugs. Demand reduction strategies hold the most promise for long term reduction of use. Employee Assistance Programs (EAP's) have begun to expand their focus to include identification and referral of drug-impaired employees and offer great potential for reducing workplace-related drug use. Effective EAP's communicate the organization's policies and educate employees as to the dangers of drugs in the workplace. Approximately one third of employed Americans have access to an EAP. A second and more controversial strategy for reducing demand for drugs is drug testing. The application of urinalysis techniques to detect drug use has been adopted by a majority of the largest employers in the U.S. and today approximately one third of all employed Americans work in a business with a drug testing policy.

Given that a large majority of the adult population is employed, worksite programs have unique potential for success in reducing drug use and its adverse consequences in a large proportion of the drug using population. The social and fiscal conditions tied to employment provide the basis for potentially powerful techniques to modify behavior. By addressing the problem in the workplace, there is inherent prevention with a staff properly trained in identifying the casual drug user. Obviously, this acts as an effective deterrent by increasing the chances of getting caught. Mechanisms are in place for observing performance, for setting standards for performance, and for establishing sanctions to enforce those standards. The Drug-Free Workplace Act of 1988 is one tool with which some of these techniques are implemented.

THE DRUG-FREE WORKPLACE ACT OF 1988

On November 18, 1988, Congress passed the omnibus Anti-Drug Abuse Act. Title V of this legislation, User Accountability, contains several subtitles, of which one is the Drug-Free Workplace Act. For you legal buffs, this law can be found in the United States Code, Title 41- Public Contracts,

Section 702. Section 702 pertains specifically to requirements for Federal grant recipients. Rather than speak in legalese, I will try to summarize the law:

No one shall receive a grant from any Federal agency unless such person has certified to the granting agency that it will provide a drug-free workplace by -

1. Publishing a statement notifying employees that the unlawful
   - manufacture
   - distribution
   - dispensation
   - possession
   - and use

   of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations.

2. Establishing a drug-free awareness program to inform employees about -
   - the dangers of drug abuse in the workplace;
   - the University's policy of maintaining a drug-free workplace;
   - any available drug counseling, rehabilitation, and employee assistance programs; and
   - the penalties that may be imposed upon employees for drug abuse violations.

3. Making it a requirement that each employee to be engaged in the performance of such grant be given a copy of the written policy.

4. Notifying the employee, that as a condition of employment, the employee will -
   - abide by the terms of the policy; and
   - notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than 5 days after such conviction.

5. Notifying the granting agency within 10 days after receiving notice of a conviction.

6. Imposing a sanction on, or requiring the satisfactory participation in a drug abuse assistance or rehabilitation program by any employee who is so convicted.

7. Making a good faith effort to continue to maintain a drug-free workplace through implementation of all of the above.

OUR EXPERIENCE

Butler University was founded in 1855 by members of the Christian Church. The University consists of five colleges: Liberal Arts and Science, Pharmacy, Business Administration, Education, and the Jordan College of Fine Arts. Presently, there are approximately 4000 students and 500 full-time faculty and staff. While the student body has increased and the faculty has grown even more, the support and administrative staffs have not grown in relative terms with the University's rapid growth. Therefore, as is true in most smaller private institutions, we administrators wear many hats. The Physical Plant consists of approximately 100 employees including a contract housekeeping service.

Our first experience with drugs in the workplace originated when a member of the Physical Plant Department, went to the Director of Public Safety and Pat, Assistant Vice President for Administrative Services. He stated an uneasiness working with others who were under the influence of drugs while at work, Ours was a unique case in that there were several people identified as being involved with drugs in the workplace. The informant had very detailed and specific information as to the times and locations of the drug activity.

Our investigation began with a conversation between our legal counsel, Pat, and myself. Because of the detail and the alleged widespread involvement, we believed that there was use of some kind. We brought all those identified in for questioning and all denied using drugs in the workplace. We also asked each person if they would submit to a drug test. All those involved complied with our wishes and, there were some positive test results. Those who tested positive were suspended for one week without pay, and were entered into a substance abuse education class, for which the university paid.

I must bring up at this point that while there were people who did test positive, it did not necessarily prove that they were using drugs in the workplace. In fact, the two who did test positive admitted to me beforehand that they would probably test positive, because they smoked marijuana the previous weekend. The reason I bring this up is that immediately following the investigation, we held a departmental meeting where many members of the staff protested vehemently that it was not stated anywhere in our written policy that they could not use drugs on an occasional or recreational basis, away from the workplace. In fact, many said that during their interview process, they were informed that drug or alcohol use was not tolerated on the job, but what they did on their own time was their own business. I will be the first to admit that nine months ago, I really did not give our Drug-Free Workplace policy much thought, other than that it was another governmental regulation with which we had to comply. Have I ever learned a thing or two in the past nine months!

In discussing our investigation with our legal counsel, I learned that the legal definition of "possession" includes any measurable amount of a controlled substance in the body's system. It was fairly obvious that we needed to revise our current policy and make things very explicit as to the definition of possession. If you would like information on the list of controlled substances you can refer to 21 CFR, part 1308, or the Narcotics Identification Manual, published by the United States Customs Service. There are literally hundreds of drugs defined as controlled substances, however, they may all be broken down into a few simple categories: opiates, such as heroin, morphine, and codeine; hallucinogenics such as marijuana and LSD; depressants; stimulants; and coca leaf derivatives such as cocaine and crack.

Back to our investigation. One person, who was the ringleader according to the informant, had his locker and automobile searched by the Department of Public Safety. This too, was something which our legal counsel informed us that we had every right to do. Immediately upon that search, and my escorting several individuals up to the Personnel Office, our entire staff knew that something was amiss. So, I scheduled a departmental meeting.

The first of two departmental meetings took place without Pat, and there were several questions which the staff asked that I was not able to answer. There was terrific emotion and concern amongst the staff as to how the situation was handled. I think it was at this point that I realized that we needed to pay more attention to the existing policy, and develop it to a point where everyone knew exactly where they stood with respect to drugs in the workplace. I really struggled between that of one who is supposed to support my staff and that of the administrator, hired to enforce University policies. A few felt that their constitutional rights had been violated, and that we had no right to search someone's car. One of the biggest complaints was that of the persecuted Physical Plant employee, and "They would never have done this to a faculty member." A member of our staff, who has been with the University for more than fifteen years said to me a few days after the incident, "I got to work this morning and I didn't recognize the place. It wasn't the Butler I know." Another person asked me if the student newspaper was aware of the incident. I remember something like, "I'll bet they would just love to get their hands on this one." It was then that I envisioned all the things that I had tried to do in the way of developing a more professional image and improving public relations going up in smoke - no pun intended. Another concern many people shared was the speed with which we brought everyone in for questioning, based upon one person's allegations. By this point in the meeting, most people were not willing to listen to my response that we had an obligation to investigate. While I did my best to answer their questions, the staff requested a meeting with Pat and our legal counsel. I immediately briefed Pat as to what the staff's main gripes were, in order to give her an idea of what to expect at the next meeting. We then spent a substantial amount of

time on the phone with legal counsel again. All three of us agreed that it was not a good idea to ask our legal counsel to attend the meeting.

At the next meeting, Pat did most of the talking, thank goodness. In a very matter of fact way, the staff was informed that we have a responsibility to maintain a drug-free workplace, and if that meant searching someone's automobile for probable cause, or administering drug-tests for probable cause, we had every right to do so. We made it clear to the staff that if we had not investigated, and at some later date we had a serious accident, whereby a student, or anyone for that matter, may have been injured by one of these people who was under the influence of drugs at the time of the accident, we would be exposed to some serious potential liability. And, for the fact that we operate under the at-will employment relationship, we can terminate for any reason, except the wrong reason, such as race, religion, etc., as well as the employee can choose to leave for any reason, such as, if he or she feels strongly enough about a University policy. To this day, nobody has come up to me and said that they were leaving because of our policies and procedures regarding drugs in the workplace. While this may seem to some to have been a hardline approach toward dealing with the staff, it was critical that we make it clear that we were going to take any possibility of drugs in the workplace very seriously. Regardless of the Drug-Free Workplace Act, we do not want drugs on our campus - period.

While many people still disagreed with the way we handled the matter, I believe that now everyone has a clear understanding of their rights as employees, and like it or not, and I don't, this society of ours has become extremely litigious.

At this point, Pat will speak about how we have revised our old policy and some things to think about when considering your drug-free workplace policy and, if appropriate, a drug testing policy.

EXPLICIT POLICY

After this incident, it became obvious that what we thought was a clear policy that met with the intent of the Drug-Free Workplace Act was not being interpreted as we intended. And, while we had advice from our legal counsel, this still did not work out as smoothly as we would have liked. We all agreed that a clearer policy needed to be implemented and communicated.

We promised the staff that we would improve the policy and make it more detailed and that we would institute some drug education into the workplace.

At this point, I would like very much to hold up our new policy and tell you how proud we are to have it and how simple it was to implement. I

think we fully expected that to happen when we were preparing for this paper six months ago. Instead, we have put together a new draft and it will be taken through channels such as the faculty assembly, and administrative and staff groups. Perhaps as I describe to you some of the pitfalls that we encountered, if some of you have already been through this, you can offer us some suggestions.

Improving the policy became more of a challenge than I had at first suspected. My intent was to take a policy that had already been developed for our Safety Department and institute it campus-wide. Well, this was certainly easier said than done. Several issues in Safety's policy, while very necessary in a safety and law enforcement setting, were not well received by the rest of the University. I decided to look at this detailed policy to see if there was some way to put enough into it to allow the University the authority it needed to take care of the real problems, when they came, yet reassure the staff and faculty that the University would not misuse this authority. Also, we are not a union campus and I would like to keep it that way, so any policy must be drafted with the idea that everyone buys into it and there is some input from those who will have to live under the policy.

ALCOHOL - IN OR OUT?

One of the first decisions we needed to make was whether we wanted to incorporate alcohol into our policy. All the research indicates that alcohol is the most commonly abused drug in America and in American workplaces. At first pass it was easy to say "of course", include it. Then, the first exception came into play. What do we do about the picnic for the Physical Plant where the University provides the beer? What do we do about the wine and cheese receptions that the president requests to which employees are invited? We decided to leave alcohol in as part of the policy but to make an exception for University sponsored events, knowing full well that we would not eliminate the liability we face each time one of these functions occurs and the double message we are sending.

TESTING

Our next step was to decide how far to go on testing. Do we test every applicant, test for probable cause, accidents, randomly? One way to send a clear message of a drug-free workplace is to test all applicants; but, testing is a complex issue. It's not addressed in the Drug-Free Workplace Act. It's expensive. It's invasive and not very friendly, if your trying to make your university an attractive place to work. It also depends on your geographic location. If every other employer in the area is testing applicants, then, as a matter of self preservation, you will need to drug test applicants, too. In our case, pre-employment testing is not a common practice among employers in Indianapolis, and from a cost effectiveness point of view, research would indicate that very few tests come up positive therefore, it is

not cost effective. On that issue, we may argue, however, that it's like insurance. You are paying for these people to self select themselves out. Only those who are pretty sure they will pass will apply for positions.

We did not really consider random testing. This is, by far, the most controversial testing option and I would hazard a guess that it would not go over well with faculty. While it is the fairest, because everyone is treated equally, and it has the greatest deterrence and protection capability; it is much more likely to get you into lawsuits. These lawsuits often involve privacy rights, disability discrimination protection, an employer's ability to adopt testing in a unionized work place, or state statutes dealing with drug testing. However, two of the most important cases decided last year favor the employers. In the case of National Treasury Employees Union v. Von Raab, the U.S. Supreme Court upheld drug testing of U.S. Customs Service employees in positions directly involved in drug interdiction or carrying of firearms. The second case was Skinner v. Railway Labor Executives Association. The court upheld Federal Railway Administration regulations mandating blood, breath, and urine testing of railway employees involved in major train accidents. In these cases, the employer's need to ensure safety outweighed employees' privacy expectations under the Fourth Amendment. Again, I would ask if our situations would be this clear cut.

Some companies random test only those employees in "safety-sensitive jobs. Again, this may be clear-cut in some industries, but, as you all know, in our universities, it's not so clear cut. And, again, you run the risk of making the Physical Plant worker feel singled out from the rest.

There could be no testing at all. An article written by Joyce Frieden in Business and Health, July, 1990 describes the philosophy of Ben & Jerry's Homemade, Inc., the ice cream manufacturer located in Waterbury, Vt. They do no testing. Vermont is one of the states the prohibits random drug testing. They say their no-testing policy is philosophical. There's a strong feeling within senior management that testing for substance abuse of any type is invasive. Supervisors in the 300-employee work force refer employees to counseling if they notice a problem. Employees can also self-refer. Ben & Jerry's pays 100 percent of the cost of counseling for as long as the employee uses it. While no hard numbers are available, anecdotal information shows the system is "used with reasonable frequency, and its success rate is quite good." The company tries to gear its entire health and benefits plan to wellness, and includes substance abuse rehabilitation as part of the plan. Sounds good, but this still didn't seem to meet our needs.

One other option was revealed in some of the literature. This was a new approach of performance testing. Instead of testing employees for chemical evidence of drug use, some companies are testing performance of specific job-related functions. The same Business & Health article gave the example of the suggestion that airline pilots play Pac-Man. If they can't get

to level 2, they're not fit to fly. It doesn't matter what the reason. Good idea in theory, but not very practical for us at this time. So what do we do? One thing we did know for sure, we do have the right to demand top performance on the job.

After discussing this at length, we decided that as a good first step we would take the approach that we would test "for cause." This led to the obvious question. What does reasonable cause or suspicion mean? Generally reasonable suspicion begins with a supervisor, line manager, or staff members "observing a significant degradation" in an employee's performance, or in our case, someone observing the use or distribution of the drug. We felt we had reasonable suspicion. But, I feel this needs to be more clearly spelled out in the policy. It was obviously a serious bone of contention in the eyes of all the physical plant workers, not just those involved in the investigation. We will now state that supervisors will be consulted and a thorough investigation will take place with each report. Every effort will be made to protect the privacy of the individuals involved. This is also the part where some definition of "under the influence" needs to be addressed. Many of our workers felt that if they used marijuana on the weekends, that there was no problem coming to work on Monday. We will have a statement indicating specifically that "under the influence", or "in your system" also qualifies for disciplinary action.

SEARCHES

Searches also need to be addressed. How will they be handled? When will they be reasonable? The policy must be strong enough to allow the university to conduct a search when it is deemed necessary, but the staff needs some reassurance that this authority will not be abused.

In our state, we have every right to do a search at anytime, but that does not mean that we would want to exercise that right on a whim. None of us wish to work in a police state.

We will conduct a thorough investigation first, including checking with the supervisor, talking with the accused, trying other methods of verification first, before a search will take place, unless there is obvious and visible verification of use or distribution of drugs.

POSITIVE RESULTS

What should we do if we get positive results? In the case of the Safety employee, their policy was clear. That person was fired. Again, in the article I mentioned before, it was stated that firing is not the answer. Twenty percent of the time, you'll hire somebody else with the same problem. In our Safety Department, pre-employment drug testing is used. A more logical approach is to provide rehabilitation for them and give them

another chance. We did this for two of our employees. In one case, the person thanked us for the chance to get his life straightened out. That was certainly an unexpected positive out of all of this. But, what it said to me was that this is going on all of the time, probably much more than any of us are willing to admit. Most employers refer to the company's employee assistance program. We have an EAP, but in this case, we went directly to a facility in town and contracted their services specifically for our people.

A little fact about EAP's. Only 1 percent to 3 Percent of companies use on-site EAP offices. There is still a stigma attached to getting help. EAP's is a subject for another session.

EXPECTATIONS

In looking back on our situation, after doing the research for this paper, and for our policy, I will always wonder what the outcome would have been if I had taken a different approach. Even though I used legal counsel throughout this experience, I would like to have tried it a different way. I would like to have called in the supervisors of both the accused and the accuser, discussed the possibility of this being true, approached the accused and stated the nature of the accusation, asked him to respond and then when he denied the charge, explained, clearly, our policy, and said that if there was verified suspicion again, he would be asked to take a drug test and his vehicle, etc. could be subject to search. In this way, all involved would have been made aware of the policy, they would have all been put on notice, and, if one was bringing drugs onto campus, perhaps he would quit or get caught by another person. It seems like a more rational approach. After all, I do not believe that we are out to put on a sting operation. We are more concerned in providing a safe working environment for our employees and even more importantly, a safe environment for students.

What do I believe? I believe that above all, we must work together. Both the worker and the employer have responsibilities. Employer's have not only the legal duty to provide a safe, drug free workplace, but they have the moral obligation as well. We have been entrusted with the care of our nation's most important resource - our young people. Worker's have a responsibility, too. They owe a good day's work at their best for the employer who is providing the salary and benefits that they enjoy. Therefore, if for no other reason, we need to work together to develop trust above all else. The policies will come if trust has been established. The key word in developing that trust is COMMUNICATION. I know of no other way for employers to understand the concerns of the employees and the employees to understand the nature of the role of an employer unless we have some method of communication. I believe that we have established a good start in the communication process through the departmental meetings we held in the Physical Plant. I had visited with the staff on a periodic basis and had an established relationship. I truly believe that gave me an edge that I would not have otherwise had. They were willing to

listen, knowing that I would listen to them. You can not build this relationship overnight, so start as soon as you get back. Invite your personnel people over to talk to the staff. Build the bridge. It will go a long way when you need to develop or use a policy. Always think twice about how any policy will impact the trust that has been established before deciding how to proceed and how we would feel if this procedure were to be used on us, perhaps we could all go a long way toward making our workplaces more enjoyable.

At this point, Mike will highlight some things concerning union shops and then summarize today's presentation.

UNION SHOPS

Because there are many schools in the audience today whose Physical Plants operate with one or more union shops, I want to highlight a few points which may help in understanding any differences between a union shop and an open shop. First of all, unions have been slow in responding to the issue of drugs in the workplace. This has obviously worked to management's advantage when it comes to contract negotiations. I spoke with one school which has an agreement with its state AFSCME union which is not very strong and another which has an agreement with the teamsters which is quite strong in its representation. The only major factor in dealing with a union in a drug related incident is that union steward must be present during the proceedings of an investigation. The area in which unions play a big part is in that of drug testing.

The National Labor Relations Act covers the vast majority of private sector unionized employers. Once a union is certified by the National Labor Relations Board as the choice of a majority of the employees in an appropriate bargaining unit, the employer is restricted from making changes in wages, benefits, and terms and conditions of employment without bargaining in good faith to agreement or impasse with the union. With the growing prevalence of drug testing programs in the workplace, collective bargaining questions about the implementation of such programs begin to arise. In May of 1989, the NLRB confronted the rights and responsibilities of a unionized employer that contemplates implementing drug testing in two major rulings: Drug Testing of Current Employees. In Johnson-Bateman Co., 295 NLRB No 26, ruled that the implementation of a drug-testing program for current employees must be bargained with the union - an employer can't unilaterally implement such a program.; Applicant testing need not be bargained. In Star Tribune Co. 295 NLRB No 63, ruled that applicants are in the same position as retirees -they aren't employees covered by the NLRA, and concluded that applicant testing isn't a mandatory subject of bargaining.

CONCLUSION

In the last ten years drugs has become one of the most critical problems our society faces. Drug abuse is no longer limited only to the wealthy jet setter or the street corner drunk. It affects the young, the old, the rich, the poor, and even the unborn. Our college campuses are indeed complex microcosms where drugs and alcohol play a significant part in a student's social life, and if abused, drugs will severely detract from the academic experience. Colleges and universities should take a leadership role in educating not only the students, but other members of the campus community, about the dangers of drugs and alcohol. We must all be of the mindset that our work environment is also the students' living environment, and we must foster a drug-free environment by actively complying with the Drug-Free Workplace Act of 1988.

Due to the nature of our work - whether it be operating heavy machinery, driving a vehicle, working at high elevations, or attending meetings comprised of students, faculty, and staff, we must encourage and enforce safe, drug-free work habits. We have an obligation to the employees, students, and other members of the campus community to maintain a safe working, living and learning environment. And, when the possibility of drugs in the workplace exists, we must investigate.

When the need arises for an investigation it is best to have an explicit policy already in place, so that everyone knows what to expect. In developing that explicit policy, seek legal counsel. Laws regarding drug-testing and searches differ from state to state, and must be carefully evaluated. Moreover, it is not the intent of the Drug-Free Workplace Act to fire people and send drug using employees into the streets, but to educate and rehabilitate them - to make them healthy, productive employees and public citizens. All of us here are in the education industry, and what better opportunity to educate people than with this growing problem of drugs in the workplace.

It has been Pat's and my intention to communicate to you some of the pitfalls we experienced in an incident involving drugs in the workplace. While some of you may not have experienced anything like this, it may have sounded like we were not prepared, but in all honesty, I don't believe that we were. I strongly recommend that you take that employee handbook off the bookshelf, blow the dust off, and really examine your school's drug policy. What does it say? What does it not say? It should say as much as is required for your staff to know what is expected of them, and what they expect of you as their employer. An ounce of prevention is worth a pound of cure.

Handling Layoffs With Compassion and Dignity

Robert A. Getz
Associate Director of Physical Plant
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During these days of tight money, shrinking budgets and limited resources, reductions in work forces are becoming commonplace. After utilities, wages are most probably the biggest item in most budgets. Wages stand out like a sore thumb on line after line of job titles. After a while, they just become multiples of salary and wage bases. Five Carpenters at $45,000 equals $225,000, three Electricians at $44,000 equals $132,000 and seven Custodians at $18,000 equals $126,000. There is a $500,000 budget cut so throw in a Clerk at $17,000 and the total's reached. Send the numbers to Human Resources where the computer will print the seniority list and the layoffs with bumping rights will be turned out in letter format and given to Supervisors to be issued to the various employees. Accounting will also be given the clock numbers so that final paychecks may be calculated and issued. So long as everything is accomplished according to polices, procedures and the Union Contract, all is well. So what does this have to do with Facilities Management.

In this world of policies, procedures and Union Contracts, we've forgotten about people! We've forgotten about the art of managing people and accomplishing tasks and goals! We've forgotten about **"ESPRIT"!**

Each of those sixteen layoffs are individual persons. Each of them are living, caring people with friends and family, co-workers and supervisors. Each of their lives

touches untold others in a domino affect. The manner in which those budget cuts are administered will affect your facilities for years into the future. The **"ESPRIT"** must not be trampled.

How often does the callous Supervisor sit down with the employee and abruptly give them the choice of a quick layoff or early retirement? There's the door, don't let it hit you in the back on the way out!

How often does the Human Resources representative give the employee the wrong information concerning their options? Then when it's brought to their attention, there's a "sorry about that" attitude.

How often does the person get ostracized? Made to feel as if they'd done something wrong. A parasite in the work place.

What do these examples show those who remain? While we may not wish to admit the fact, all of us know there is a risk to employment. We all know that rough times are always possible and cutbacks in work forces are an ever present possibility. It happens to the best as well as the worst. The difference is the best maintain **"ESPRIT"**!

If a budget cut and layoff result under your responsibility, maintain everyone's dignity and protect the **"ESPRIT"**.

First, determine the extent of the budget cut and its effects as quickly and fairly as possible. Don't drag it out extending a cloud of gloom and doom over the work place for weeks unending. Publish what's to occur and make it happen quickly without prejudice or favoritism.

Second, when talking to those affected directly with the loss of job and income, be direct and honest. Don't beat around the bush and try to administer sugar coated pills. Sympathetically and honestly explain what is to occur and how it will occur.

Third, ensure that each and every person dealing with those losing position and pay knows all the options and consequences. Incomplete and incorrect information kills **"ESPRIT"**. Those employees deserve complete and correct information and nothing less. Don't ever tolerate anything less for whatever the reason. There is no reason for giving these people faulty or piecemeal information.

Fourth, treat these people with dignity and respect. They are a part of your work-family. They will always be

a part of your work-family. Just because they will no longer be seen in the work place does not mean they will never again be seen. They're like a relative who's moved to a different town or state. They're still alive and part of your work place through their friends. You want them always to feel welcome. They might even come back to the work place. You don't want them returning with a chip on their shoulder. You want them to return as an old friend with good feelings and good memories.

Fifth, remember that those employees have a family. You've not only affected your employees but also their entire family. No matter how well understood the separation, there's a real hurt which goes home with the employee. Show your feeling and sympathy. There is no lost honor in letting the family of each employee know how much these separations hurt the work place. Give the family honor and dignity. Avoid the registered letters and official notices by mail. Send a note of appreciation for the time of service. Let those families know a value was placed on their loved ones. Don't let them believe it was just a number or dollar amount which had to be eliminated.

Finally, you've got those who are still a part of the work force who are wondering who's next. You've got to kill the rumors and fear. You've got to be honest and let them know what lies ahead. False hopes and hidden agendas are quickly seen by any work force. Put all the cards on the table - you're dealing with adults and responsible people. Treat them as such and maintain the **"ESPRIT"**.

The problem is, if you lose the **"ESPRIT,"** you lose everything. These people are the life of your facilities. They make the facilities happen. They turn the screws, unplug the toilets, sweep the floors, type the requisitions, make the phone calls, diagnose the problems, deliver the mail, drive the trucks, install the phones and handle all the other myriad of activities which allow a facility to function. Those facilities do not function without those people and their **"ESPRIT"**. Keep it alive and well or you're guaranteed to lose your facilities.

FACILITIES ASSET MANAGEMENT

Managing the Facilities Portfolio

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No Common Approach

Though much has been written about the causes and size of the deferred maintenance problem, comparatively little has been published about conceptual models for analyzing, assessing and funding facility assets on a consistent basis. No commonly accepted approach exists for managing and reporting on the single largest financial asset of a college or university. Without a common approach, it is difficult to exercise stewardship over these assets; college and university policy makers are placed in the unenviable position of making important facility-related decisions without an adequate decision-making framework.

With a replacement value of some $300 billion, college and university facilities eclipse any other category of financial assets on an institution's balance sheet. By comparison, the aggregate market value of college and university endowments is estimated at $75 billion, one-fourth the value of facility assets. Yet, unlike other types of assets and other aspects of financial management, few tools, models and critical indicators exist for assessing facility conditions on a functional and financial basis. Senior management and board committees often contend with long lists of needs and projects but do not have firm grasp of the context in which those needs exist. Nor do they have the ratios, indicators or framework that will allow them to make informed choices. Until a commonly accepted framework is established, it will be difficult to make any meaningful progress in solving the current problem.

Toward A Conceptual Framework

Several important points must be established before developing a conceptual framework for managing facility assets:

- Facility assets are diverse, representing the broad array of housing, laboratory, office, classroom, athletic, retail, and other facilities necessary to fulfill an institution's mission and objectives. Given this diversity, facilities should be viewed as a ***portfolio*** of assets and managed accordingly.

- A goal of facility portfolio management should be the maintenance of a state of clearly defined ***equilibrium*** for all assets within the portfolio -- the maintenance of the functional and financial value of the facilities to the institution over the long term.

- The maintenance of facility equilibrium requires that steady and predictable capital reinvestment in existing facilities based on an objective assessment of facility conditions and the overall goals and objectives of the institution. This ***reinvestment rate*** can be quantitatively determined based on the age, complexity, and condition of the assets within the facilities portfolio.

- Facility ***renewal and replacement*** represents the ongoing cost of current operations, similar to salaries, benefits, and utilities, and should be factored into overall institutional budgetary planning.

- Facilities portfolio management requires an ***ongoing assessment*** of facility conditions that is tightly linked to the institution's financial planning.

- Facilities portfolio reporting and management are essential stewardship functions, and should be interwoven with other key policy and stewardship responsibilities.

The conceptual framework presented here is drawn from the model adopted by many institutions in the management of endowments, a subject that has developed a considerable body of knowledge. Many boards, acting in their fiduciary role, have adopted formal endowment spending and asset allocation policies. Typically, these spending policies limit the amount of principal and earnings that can be taken from the endowment for current purposes. This figure, usually about 5 percent of a rolling multiyear market value, is one of the fixed points around which an institution's budget is developed. Likewise, the board makes asset allocation decisions to balance the overall risk of assets within the endowment portfolio. The goal of these policies is to maintain the "purchasing power" of the endowment over the long term by carefully balancing investment policy and spending rules. In doing so, the board is seeking a steady and predictable endowment revenue stream for future annual operating budgets.

A similar approach can be adopted for facility portfolio management. The overall goal of facilities portfolio management should be the maintenance of the functional and financial value (purchasing power) of the facilities to the institution. As with the endowment "spending rate", a systematic reinvestment rate must be calculated and implemented to maintain facility equilibrium. This reinvestment rate, like the spending rate, should be an important component of budget development. The mix of assets in the facilities portfolio requires different investment strategies depending on the institution's needs, similar to the asset allocation strategies used in endowment management.

The fundamental difference between endowment assets and facility assets is that endowments provide revenues whereas facilities incur costs. However, as assets, both play a vital role in fulfilling an institution's mission. Therefore, the deterioration of either group of assets undermines an institution's effectiveness in the long run.

A Conceptual Overview

The management of an institution's facilities portfolio comprises four essential steps:

- ***Establish meaningful baseline data*** about facility conditions through a detailed, structured inspection process.

- ***Estimate short- and long-range renewal needs*** using the data obtained from the facility inspection.

- ***Create decision-support models*** to calculate alternate reinvestment rates and the effect those rates have on short- and long-term facility conditions.

- ***Report on the facilities portfolio*** to governing boards, senior management and line managers responsible for maintaining the portfolio.

ESTABLISHING A BASELINE DATABASE

An effective facility management strategy begins with an essential first step: establishing a detailed baseline database of facility conditions. Most institutions have a good grasp of the number of campus buildings, their ages, and their square footage. Fewer institutions have detailed information about facility conditions on a building-by-building basis or have organized this information in a manner that supports ongoing analysis and decision making. Without explicit, well organized knowledge of facility conditions, it is impossible to plan, fund, and execute a meaningful facilities portfolio management strategy.

A baseline database defines an institution's unique facilities portfolio. Each asset in the portfolio must be identified, inspected and assessed. Data can then be used to group similar types of facilities (dormitories, classrooms, laboratories) to assess conditions for various facility types and for the overall portfolio. The baseline data must be obtained

through a detailed, systematic inspection of facilities and compiled in a logical manner to facilitate future use.

Facility Condition Inspection Program

A facility condition inspection program provides management with the means to identify deficiencies in order to take timely, cost-effective corrective actions. A facility condition inspection is a visual inspection of all architectural, civil/structural, mechanical and electrical components of each facility; the inspection is performed to identify specific maintenance and repair requirements. If an effort is made to distinguish between maintenance and repair deficiencies and other functional needs, the inspection program can be used to address facility adaptation or facility improvement opportunities.

A properly designed and implemented facility condition inspection program provides a comprehensive evaluation package that can be used to make informed facilities portfolio management decisions.

Facility Condition Assessment

The facility condition inspection should comprehensively identify the physical deficiencies that currently exist in each facility, resulting in a quantified description and cost estimate for each deficiency. To obtain the full benefits of this detailed database, the facilities manager must conduct a structured review and assessment. This approach is called a facility condition assessment; the assessment identifies and analyzes related data for each facility. The resulting data can be sorted, rearranged, and further summarized in different forms to facilitate both policy-level and detailed analysis of facility conditions.

Building on Facility Condition Inspection Data

The objective of the facility condition assessment is to provide a comprehensive and clear understanding of overall facility conditions. The assessment is structured for different functions and levels of users within an institution, including the governing board, executive officers, financial managers, the institution planning staff, and physical plant personnel. Each potential user will not need the full range of information that could be generated; users must be selective in identifying specific data areas and items to support individual requirements.

Facility condition assessment information can be used to:

- Provide the basis for evaluating deferred maintenance and funding requirements.
- Plan a deferred maintenance reduction program.
- Compare conditions between facilities and with other institutions.
- Establish a facility condition baseline for setting goals and tracking progress.
- Develop cost estimates and priorities for major repair and replacement projects.

- Improve communication of facility conditions.
- Provide accurate and supportable information for budget planning and justification.
- Facilitate the establishment of funding priorities.
- Develop budget and funding analyses and strategies.

The Facility Condition Index as a Measure of Condition

In the overall assessment of facility conditions, a simple measure of the relative condition of a single facility or a group of facilities is required. The facility condition index serves this purpose. The facility condition index is the ratio of the cost of deficiencies to the current replacement value (CRV):

$$\text{Facility condition index:} \quad \frac{\text{Cost of Deficiencies}}{\text{Current Replacement Value}}$$

The cost of deficiencies is the total dollar amount of existing maintenance and repair deficiencies. The figure does not include projected maintenance and repair or other types of work, such as adaption or new construction. If those items are included in the facility condition inspection database, they should be coded in a way that they can be separated for assessment purposes.

The facility condition index provides a readily available and valid indication of the relative condition of a single facility or group of facilities. It enables the comparison of conditions with other facilities or groups of facilities. The higher the facility condition index, the worse the condition. For example: Facility A with a current replacement value of $1 million and total deficiencies of $10,000 has a facility condition index of .01. Facility B with a current replacement value of $100,000 and total deficiencies of $10,000 has a facility condition index of .10. In relative terms, Facility B is in considerably worse condition than Facility A, since 10 percent of the value of Facility B has deteriorated, as compared with only 1 percent of Facility A.

The facility condition index does not take into account the differences in priorities between individual deficiencies. If the deficiency in Facility A is a severe roof leak that is damaging essential equipment and the deficiency in Facility B is a deteriorated but less urgent item, the roof on Facility A must be ranked above the Facility B deficiency even though Facility A is in much better overall condition. Conversely, in the case of two facilities with similar relative conditions, but with deficiencies of no appreciable differences in priority, it would be a more effective use of resources to correct the deficiencies on the facility in worse condition in order to prevent further and frequently accelerating deterioration. Knowledge of the overall condition of the facility and the relative priority of individual deficiencies, is essential to making informed and effective decisions regarding the planning and utilization of facilities resources.

To use the facility condition index to evaluate facility conditions, suggested condition ratings are assigned facility condition index ranges as follows:

FCI Range	Condition Rating
under .05	Good
.05 - .10	Fair
over .10	Poor

These subjective ratings are based on results of comprehensive condition inspections at a number of institutions and discussions with facilities personnel.

Use of Facility Condition Assessment Data

The facility condition assessment database provides an opportunity to develop and evaluate an extensive range of facility data. Sample arrays of how the data can be sorted, tabulated, summarized, and presented follow. The variety of reports is limited only by individual initiative and needs.

The reports present data in a format that is of primary interest and use to management and staff personnel who are involved in the detailed analysis of facility conditions. In this format, data facilitate the planning of budgets and support program planning and execution. These data can easily be consolidated into meaningful and presentable formats for communicating effectively.

Facility condition tabulations and summaries. Facility condition tabulations and summaries provide an overview of total facility conditions. Data displayed for each facility include age, gross square footage, current replacement value, total cost of deficiencies, usage code (HEGIS Code), and facility condition index. To facilitate the evaluation of relative facility conditions, a facility condition index is computed for each facility. Summaries are then compiled to focus on two aspects of the condition review: individual facilities and groups of facilities. Facility condition information is presented in the following ways:

- By facility
- By usage code
- By facility age, summarized by facility age range
- By facility condition, summarized by facility condition index range

ESTIMATING SHORT- AND LONG-RANGE RENEWAL NEEDS

An effective program to renew and maintain institutional facilities requires solid facility condition information and careful planning. Any successful renewal program should encompass two types of facility investment needs:

- an estimate of short-range investment needs to reduce deferred maintenance backlogs to an acceptable, predetermined level; and

- a quantification of longer-range facility component renewal needs.

Both short- and long-term needs must be addressed concurrently, if an institution is to achieve a state of facilities equilibrium within a reasonable period of time. Deferred maintenance represents facility condition deficiencies that have not been addressed, typically due to a lack of funds. Hence, any short-term renewal program represents "catching up" with historical problems in order to bring facility conditions to a desired level. However, future facility investment needs also must be determined to prevent new backlogs of deferred maintenance from accumulating.

This approach recognizes that:

- Historical facility underfunding problems must be addressed through a short-term remedial program of deferred maintenance reduction.

- Facility conditions continually deteriorate over time and require ongoing investment to maintain their functional and financial value to the institution.

As a result, the early years of an institution's renewal program will require funding to reduce existing deferred maintenance backlogs and to address ongoing facility renewal needs. If on-going needs are not addressed, a college or university will likely be faced with the same facility renewal dilemma in future years.

Deferred Maintenance Reduction Plan

The five major steps in developing a deferred maintenance reduction plan are:

. Conduct a condition inspection.
. Identify and tabulate major deficiencies.
. Identify and tabulate deferred maintenance deficiencies.
. Determine funding available for deferred maintenance reduction.
. Compile a preliminary deferred maintenance reduction plan.
. Document individual projects.

Component Renewal

Projections of long-range capital requirements for renewal of the physical plant are essential to the overall institutional capital planning and budgeting process. Because a significant percentage of campus facilities were constructed during the past 35 years, many are experiencing or approaching their first cycle of major component deterioration; the need for the additional funding for component renewal is becoming critical.

The concept of using life cycle costing was presented in the first volume of this project, *Financial Planning Guidelines for Facility Renewal and Adaption*. The basic premise of the life cycle concept is that a building's useful life is limited by the durability of its systems, and that a building does not fail as a whole but by its components (electrical systems, roofing systems, etc). *Financial Planning Guidelines for Facility Renewal and Adaption* discusses general aspects of the facility subsystem approach for determining facility renewal requirements, and provides a simplified example of related calculations to illustrate the concept. The following section elaborates on this approach and provides more detailed guidance on how it can be developed and used to improve the long-range planning and decision-making process.

Assumptions

A number of assumptions are necessary to formulate a standard component renewal procedure. These assumptions may not always hold true; consideration should be given to the exceptions. The approach is not intended to give an exact cost estimate of component renewal for any one facility or facility component, but is aimed at providing guidance for establishing a reserve for funding component renewal for the institution as a whole.

The following assumptions are made in developing this estimating approach:

. The average useful life of a building is 100 years. This assumption is based on the concept that foundations and substructures normally have a useful life of 100 years and would not be replaced.

. Buildings comprise a finite list of major components that deteriorate beyond the scope of major repair and require replacement in predictable periodic intervals during the life of the building. The frequency of these intervals, or cycles, is assumed to be 10 years or more.

. Not all components experience 100 percent replacement. For example, roofs are usually replaced completely, whereas a heating or cooling replacement may not include replacement of ductwork. Component renewal occurs if 50 percent or more of the component requires replacement.

. There are different types of construction for each component with different materials, different renewal costs and different useful lives.

. Buildings must be categorized by type and usage to allow for different proportions and complexities of components.

. In accordance with the "law of large numbers", the average costs for component removal and construction in various accepted publications are assumed to be adequate for this purpose, on the condition that careful attention is given to how these costs are applied.

. Long-term planning is facilitated by using five-year increments for component renewal projections. This guideline is based on two assumptions: it is more reasonable to predict a five-year term in which a component will fail than to attempt to predict the exact year; and there is some degree of flexibility in scheduling of the component renewals.

Developing the Component Renewal Estimate

When developing future component renewal needs, the following considerations should be kept in mind. The procedure should be general enough that it can be used at any institution, with a minimum of expertise required for data collection and calculation. The intent is to estimate component renewal costs for an institution, not for a particular facility. However, the technique should produce estimates that are correctly weighted for the total institution (for example, mostly one-story brick buildings or a high percentage of recreational buildings). The procedure also should allow for any exceptions to the rules that would skew the end results (for example, historical buildings or unusual types of buildings).

The following steps must be taken when developing a procedure for estimating component renewal costs:

Categorize types of buildings. Source data for component renewal are usually in the form of construction cost per gross square foot for different types of buildings. Appropriate building categories must be selected that will be compatible with the source cost data and correlate with the specific buildings to be costed.

Develop a list of components to be renewed. Building components have been defined in a variety of ways. Definitions that are too broad or too detailed may generate problems in application and analysis. One essential condition in selecting the component list is that it must be compatible with the source of unit costs that will be used. The list of components used in this example is shown in Column 1 of Figure 3-5.

Develop list of construction types for each component. Components may comprise of a variety of materials which could have different useful lives and different renewal unit costs. This list should also be compatible with the source of unit costs. The materials used for each component in this example are shown in Column 2 of Figure 3-5.

Determine the average percentage of renewal for each component type. No recorded historical data are available for this determination, so these percentages must be estimated. A review of the components identified for renewal during a comprehensive condition

inspection can assist in making these determinations. The percentages of components renewed in this example are shown in Column 3 of Figure 3-5.

Determine average useful life of each component. As contrasted with the lack of data on component renewal, there is an overabundance of information on component useful life. However, many of these sources do not delineate for different component materials, and there are considerable variations in useful life values between sources. It is therefore suggested that experience and judgement must be applied liberally in making these determinations. The useful life of each component used in this example is shown in Column 4 of Figure 3-5.

Estimate component renewal unit costs. A number of published sources of unit cost data might be applicable to component renewal (*e.g., Means Estimating Cost Data Series*). In some instances, these data apply to one set of construction materials only, or are an average of several different materials. The data may also apply to construction only, and do not include the cost of removing the old component. A set of renewal costs should be developed to differentiate between types of buildings and component materials, and to cover the full cost of renewal.

When developing component renewal costs, consideration should be given to the units used. The easiest method is to apply costs based on the gross square footage of the building. However, some exceptions to costing on the gross square footage basis may have to be made. For example, roof replacement costs relate more closely to square footage of roof than to gross square footage of building. Also, elevator replacement cost would seldom relate to building gross square footage.

BACKLOG AND FUNDING PROJECTION MODELS

Up to this point, funding projections have been made based on the premise that the deferred maintenance backlog will be reduced to zero in five years, using constant dollars, and that annual maintenance and repair is funded at a constant level. However, many institutions lack the funds to launch an optimal facility funding program and, out of necessity, must begin with a more modest facility renewal program. In doing so, the institution must have a solid understanding of the effect of a particular funding level on overall facility conditions.

When beginning any facility renewal program, institutions must address the concept of a facility reinvestment rate. In this context, reinvestment rate is defined as the amount of funds invested in facilities as a percentage of current replacement value. For example, an institution with a current replacement value of $10 million and a funding level of $400,000 would have a reinvestment rate of 4 percent. The reinvestment rate is calculated in the same manner as the facility condition index. The facility condition index articulates the dollar value of deficiencies as a percentage of current replacement value. The reinvestment rate expresses funding as a percentage of current replacement value. To

adequately analyze various funding levels vis-a-vis facility conditions, some modeling tools are required.

The deferred maintenance backlog does not necessarily have to be reduced to a level of zero. In fact, it might be a wise decision not to reduce the backlog to zero, so that a number of minor maintenance items may be grouped together to more efficiently accomplish work. Here again, the facility condition index is useful for indicating facility condition and helping to establish a goal for backlog and funding levels.

Some additional factors should be considered when planning backlog and funding levels:

- The rate of inflation. A deficiency will cost more to repair next year than it would this year, due to an increase in labor and material costs.

- The rate of overall plant deterioration. Facilities are in a constant state of deterioration. While the identified deficiencies are being corrected, other deficiencies are being created.

- The rate of backlog deterioration. A component with an existing deficiency usually will deteriorate at somewhat faster rate than a component that is in good condition. For example, a roof deficiency such as a blister or tear, if left unattended, may collect moisture and damage the sheeting underneath, or allow seepage of water to equipment below.

- The rate of plant growth. As the gross square footage of the institution increases, so does the potential for maintenance and repair deficiencies.

The Backlog Projection Model

The backlog projection model projects the level of deferred maintenance backlog that will be obtained when assuming a certain funding level. It helps answer the question: If annual funding for maintenance and repair is provided at a given level for "n" years, what will the backlog level be at the end of this period? To apply the model, the current replacement value and current backlog level must be determined, the annual rates of inflation, backlog deterioration, plant deterioration, and plant growth must be assumed, and the theoretical annual funding level must be applied.

The formula project backlog is:

$$B_n = (B_{n-1})(1 + I_n + D_n) + (V_n)(P_n) - F_n$$

This formula assumes the following:

B_n = Backlog at end of year n
V_n = Current replacement value at end of year n,

$V_n = (V_{n-1})(1 + I_n + G_n)$

I_n = Inflation rate in year n
D_n = Backlog deterioration rate in year n
P_n = Plant deterioration rate in year n
G_n = Average plant growth rate in year n
F_n = Planned funding in year n

The Funding Projection Model

The funding projection model projects the level of annual maintenance and repair funding required to produce a certain backlog level. It helps answer the question: What annual funding levels will be required to meet a given backlog target in "t" years? To use the model, the current replacement value and current backlog level must be determined; the annual rates of inflation, backlog deterioration, plant deterioration, and plant growth must be assumed; and the target backlog must be applied.

The formula for funding projection is:

$$F_n = (B_{n-1})(1 + I_n + D_n) + (V_n)(P_n) - B_n$$

This formula assumes the following:

F_n = Projected annual funding
B_t = Target backlog at end of t years ("t" may be greater than, equal to, or less than the number of years projected)
B_o = Backlog at end of year 0
B_n = Backlog at end of Year n, $B_n = B_{n-1} - [(B_o - B_t)/t]$ for $n \leq t$; $B_n = B_t$ for $n > t$
V_n = Current replacement value at end of year n, $V_n = (V_{n-1})(1 + I_n + G_n)$

I_n = Inflation rate in year n
D_n = Backlog deterioration rate in year n
P_n = Plant deterioration rate in year n
G_n = Average plant growth rate in year n

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Business Plan for Facilities Management Operations

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INTRODUCTION

With today's dynamic economic, technological, and political environments, rigorous planning and analysis is necessary for businesses if they are to survive. The process of strategic planning is geared toward an analysis of an organization's potential. It involves an assessment of its external opportunities and threats, a study of its internal strengths and weaknesses, and ultimately the determination of which course is best for achieving its goals.

Since this may be the first formal planning effort undertaken in an organization, it is vital to the success of the effort that all key participants in the organization understand the concepts and procedures outlined within the process.

MISSION STATEMENT

The first step and key to a successful Business Plan starts with stating the mission of the organization. The mission statement must include all management levels throughout the organization. These designated management levels must decide what their "businesses are" and "what it should be." The basic purpose and mission is the foundation for the collective aims throughout the entire organization.

The Mission Statement determines the competitive arena in which the business will operate. It states what services are supplied

and what potential services would be possible. In identifying the underlying thrust of the business, it is important that it is stated both in terms of service and market to prevent its scope from becoming too wide or too narrow. Facilities Management/Physical Plant is by no means a single-focus operation or a one-dimensional function.

The Mission Statement is a qualitative statement. It will give definition to identifying opportunities and threats and provide focus for strategic objectives and strategies. The activities of the business are guided and motivated by the Mission Statement.

A "sample" Mission Statement is provided for guidance.

"SAMPLE"

MISSION STATEMENT

As a major (Division, Department, Section) of the University/College, enjoying the rights and responsibilities of the competitive enterprise system, the (Division's, Department's, Section's) existence and future success depend on the competitive value and satisfaction it provides customers through its products and services.

The (Division's, Department's, Section's) mission is to improve its service delivery in the base businesses in which it elects to continue to compete by providing:

For Customers:

Quality products and services at a fair price, delivered in a timely manner.

For the University:

Maximum long-term return on investment in Facilities Management/physical plant by performing as one of the top operations in higher education. This will entail:

1. being, and being recognized as, a consistent leader in innovative and cost effective operations in every business/service the (Division, Department, Section) operates.

2. achieving better financial results than the average of those achieved by the higher education Facilities Management/ Physical Plant industry.

For Employees:

Creative motivation and benefit programs with a cooperative, productive, fair, and rewarding organizational atmosphere and work environment. This includes providing an opportunity for personal development and growth limited only by the individual's ability and

desire to advance, consistent with the (Division, Department, Section) growth and the ability to provide such opportunities.

For the Community:

Business activities that are consistent with the economic, business, and social quality of life in the areas which the (Division, Department, Section) operates.

In all respects, relationships with the customers, University, employees, and the community will be in full compliance with applicable laws and adhere to the highest standards of ethical conduct.

SITUATION ASSESSMENT AND SWOT ANALYSIS

The second step in formulating a Business Plan is to examine the organization through a very thorough assessment of strengths, weaknesses, opportunities, and threats (SWOT) analysis.

The situation assessment is an analysis of data, past, present and future, for the environment within which a business operates. This assessment should identify and analyze key trends as well as internal and external forces which have the greatest potential to the business.

Past performance data should be reviewed as a basis for determining possible trends. This analysis will reveal those shortcomings which have routinely been overlooked or ignored.

The audit of the current situation should include assessments of the following:

1. Analysis of Customers and Markets - some key questions to consider are:

   * Who are the customers?
   * Where do you find the customers?
   * How are customers internally and externally distributed?
   * How are customers classified in terms of volume?
   * How many are recurring customers?
   * How does your organization compare with the industrial average in regard to repeat calls, customer concentration, distribution, etc.?
   * How do your customers perceive you in terms of service quality, timeliness, price, etc.?
   * What is the potential for your services?
   * What competitive share do you now have?

2. Resources of the Unit

(a) financial
examples: state, local, and other revenue

(b) use efficiencies
examples: use of employee skills, revenue per employee, direct expense per employee, time per task

(c) employee evaluation
examples: turnover, productivity, image, attitude

(d) facilities
examples: physical condition, capacity, cost of operations

(e) environment
examples: conformance with safety regulations

(f) marketing
examples: information programs, dollars available

(g) business development
examples: new services to be developed or retention of current services

(h) managerial performance
examples: leadership qualities, planning, and personnel development

3. Competition

The review of the competition should focus on the industry in general and specific competitors in more detail. Some key questions to consider are:

* Dominated by one, or more competitors?
* Who are the most important competitors?
* Is competition predominantly price, service, quality, timing, performance, or image?

4. Environmental Setting

(a) economic
Example: annual budget, budget constraints, budget reductions
(b) demographic
Example: composition of your work force
(c) social
Example: what does community offer to your work force
(d) political
Example: projects constraints due to rules and regulations
(e) legal
Example: state law restrictions

Forecasts to assess the future situation should encompass the economic climate, social attitudes, changes in federal, state, and local regulations, and the competitive environment.

The purpose of the situation assessment is to aid management in identifying and analyzing the more significant environmental forces which directly affect the business. It also may serve to stimulate creative thinking and provide a base for the strategic planning process. Although the situation assessment for the Business Plan presents a view of the business's environment, it is limited to a certain point in time. Management should constantly be assessing these dynamic external and internal forces which may significantly affect the business plan.

The situation assessment should produce a list of strengths, weaknesses, opportunities, and threats (SWOT's). The chart on the following page defines and provides examples of each.

SWOT ANALYSIS WORKSHEET

ORGANIZATIONAL AUDIT (Internal; Under Management Control)		ENVIRONMENTAL ANALYSIS (External; Not Under Direct Management Control)	
(1) Strengths	(2) Weaknesses	(3) Opportunities	(4) Threats
Strengths are those conditions or characteristics which serve as the building blocks for future accomplishments. They specify the primary contributors/qualities/capabilities/ critical factors that will enable the business unit to efficiently and effectively achieve its objectives.	Weaknesses are potential problem areas that may interfere with the organization's ability to achieve its objectives. They constitute obstacles or barriers to performance improvement and tend to increase the costs associated with a particular benefit, thus reducing the possible effectiveness of the benefit.	Opportunities define those circumstances consistent with the organization's purpose, which if taken advantage of will contribute in a major way to the achievement of long-run objectives.	Threats are those factors, not under management's direct control, which may detract from the organization's ability to achieve its objectives. Threats must be identified so that managers can develop strategies for minimizing their impact upon performance.
Strengths are organizational characteristics and are controllable by management. They can be further developed in the best interest of maximizing efficiency and effectiveness.	Weaknesses are organizational characteristics and, therefore, are controllable by management. They can be resolved or overcome in the best interest of increasing services delivered.		
EXAMPLES: • Managerial expertise • Utilization of employee skills • New services being developed	EXAMPLES: • Centralized Management for Decentralized Operations • Reliance on one large volume customer • Delivering service beyond funding availability	EXAMPLES: • Growth in new buildings constructed • Emphasis on undergraduate education • Growth in research programs	EXAMPLES: • Inadequate funding • Under-maintained aging facilities • Budget reduction • Restructuring/ Right-sizing

STRATEGIC OBJECTIVES

The third step in the Business Plan, Strategic Objectives, is the end result of the SWOT analysis and the generalities of the Mission Statement made concrete. Objectives are desired results to be achieved within a specified time frame. Characteristics of Strategic Objectives are outlined below:

Suitable

The objective must support the Mission Statement.

Measurable Over Time

The objective should state what is expected to happen and when. Objectives can be quantified in terms of dollars, quality, quantity, time, costs, ratios, percentages, rates, or specific steps to be followed. By specifying objectives in this manner, they can then reasonably be measured objectively.

Feasible

The objective should be set in light of the SWOT analysis. It should be possible, not unrealistic or impractical, but yet aggressive.

Acceptable

The objective should be acceptable to the (Division, Department or Section) with respect to required funding, human resources, short-term improvements, etc.

Motivating

The objective should be attainable. Those that are out of reach or are too easy serve to demotivate. Objectives should be realistic, but aggressively so.

A "sample" Strategic Objectives follows for guidance in formulating each business's strategic objectives.

"Sample"
STRATEGIC OBJECTIVE

While some elements are attainable with predicted resources, others substantiate worthwhile returns on future incremental funding investments. Investments that generate earnings or savings that can be retained, such as labor-saving technology and utilities conservation, are also targeted as reinvestment opportunities.

The (Division's, Department's, Section's) Strategic Objectives are well balanced, demonstrating a commitment to doing the work that has to be done, plus the desire to do that work in such a way that it gives the employees a sense of self-worth and usefulness.

Categorical Strategic Objectives are:

Funding

- Integrate all fund sources into the budget planning process on an annual basis.
- Monitor and report budgeted/actual fiscal performance.
- Work toward budgeting wage employees in a fully state-funded salary line.
- Market, advertise, identify new funding opportunities; motivate decision makers to increase existing fund sources.
- Merit pay for performance recognition needs to occur along with institutional funding for employee service recognition.
- Make appropriate salary adjustments for work classifications.

Operations

- Apply technology advancements to operating methods. Computerize for labor savings, management reporting, accountability, reliability, and credibility such as in the areas of energy control, inventory, CAD, management reports, timekeeping/bookkeeping, routine maintenance, service calls, estimating project status, scheduling, quality control, and staffing/funding standards.
- Improve space, both quality and quantity. Consolidate/centralize functions such as mail services, custodial services, shops consolidation/centralization of functions.

Personnel

- Establish a (Division, Department, Section) training program. Promote apprenticeship programs and request associated funding.
- Expand use of uniforms for staff recognition and morale.
- Enhance safety programs and safe conditions of vehicles and equipment.
- Enhance employee recognition programs.
- Monitor performance in accordance with fair work standards, achievable goals and objectives, and unit work plans.

Public Relations and Image Building

- Adhere to performance standards that support excellence, service orientation, professionalism, and teamwork.
- Build upon working relationships. Value supporters and win over skeptics.
- Display and publicize the accomplishments of the (Division, Department, Section). Show the campus community the tangible returns on its investment. Continue to demonstrate that resources are placed where they do the most good.

OUTLOOK AND EXPANSION

The outlook and expansion section is the product of independent strategic thinking by each level of management, and is the fourth step in creating a Business Plan. Each unit should view this section with an entrepreneurial spirit. This section should encompass the manager's "wish list" and direction of the business as if it had complete control of its business unit. Questions such as: "If funding were available, what improvements would you make in the unit's operation and why? If funding were difficult to obtain, would your answer change?" should be considered.

This section will be the most creative portion of the Business Plan development process and will be the basis for modification of future business plans. In other words, this will be the long-range planning process reaching beyond the current year efforts.

For example, funding is essential for the removal of deficiencies that exist with respect to the condition of facilities and infrastructure and the ability of the organization to optimize its performance. As increased funding becomes available, it will be distributed so as to:

A. Restore condition of facilities and infrastructure so that they can be efficiently maintained. Ongoing restorative maintenance and routine maintenance needs to occur in order to prevent additional backlog of capital renewal and equipment needs.

B. Apply necessary labor, equipment, tools, and technology toward the enhancement of productivity and service.

C. Replace tools and equipment before they become unsafe or problematic.

D. Provide safety maintenance on vehicles and replace vehicles in a cost effective manner.

E. Utilize cost effective technologies throughout the organization. Computerized: drafting/design, irrigation, cost-control, preventive maintenance/maintenance management, systems diagnostics, performance tracking/evaluation, personnel/payroll, administration support, and other functions as appropriate.

F. Compensate employees at a level commensurate with skill level and performance. Recognize and reward exceptional performance.

G. Training and promotional opportunities that also complement Affirmative Action hiring practices.

H. Upgrade quality control activities, particularly in custodial and construction areas.

Aside from funding, efforts need to be made to remove obstacles that prevent optimum return on investments, such as:

- Streamline the organization by consolidating functions.
- Direct resources where they have the most effect.
- Market services and advertise accomplishments.
- Expand, improve, and optimize utilization of space.
- Reduce or eliminate activities or functions that do not support long-term value of the organization's service to customers.

STRATEGIES

The fifth step in a Business Plan is to make strategies. Strategies specify what will be done to achieve Strategic Objectives. They are usually categorized among four types of resources available to the business: (1) Financial, (2) Marketing, (3) Human Resources, and (4) Facilities.

Strategies establish the direction and definition of how these resources will be deployed in the business. They should also identify the specific financial methods, marketing, human resources, and facility changes required to achieve the results indicated in the Strategic Objectives. For example:

Financial

- Reallocate funds within the (Division, Department, Section) in support of first-line service. Support custodial needs for a new quality assurance program and associated staffing standards.
- Regain lost funding opportunities from subsidized recharge practices, inaccurate or incomplete utility metering, and insurance claims.
- Rebalance staff load supported by state wages and recharge revenues.
- Build accurate and comparable data bases for funding/staffing requests.
- Full-cost all recharge activities. Reduce or discontinue level of state-funded services to nonstate-funded operations and activities.
- Develop and award an indefinite delivery multitrade contract.

Marketing

- Promote "services after the sale," customer appreciation, and incentive programs with advertising through brochures and service guides, customer tours, and advisory group gatherings.
- Promote special programs: recycling, clean air, water and energy conservation. Market event support abilities and advantages to in-house rather than to contract services.

- Develop and award an indefinite delivery multitrade contract.
- Continue to publish the organization's quarterly newsletter.
- Update the Service Guide.
- Publish the organization's Business Plan and implement Phase I.
- Produce an annual report for all operations.
- Establish community involvement section in quarterly newsletter.

Human Resources

- Implement an organization's Employee Assistance Support Group.
- Effectively recruit for key positions such as: Personnel Manager, Assistant Director of Maintenance Services, and Assistant Director of Custodial Services with bright, innovative, and people-oriented managers. Make sure that their influence is positive, long lasting, and for the overall good of the organization.
- Intensify employee recognition activities: Newsletter highlights, ceremonies, celebrations.
- Promote and fund training and employee development/apprenticeship activities.
- Meet Affirmative Action goals through creative and aggressive outreach activities.
- Centralize/amalgamate maintenance operations.
- Take full advantage of favorable working relationship between this organization and others such as the Tri-University working group, local facilities organizations and professional associations.
- Strengthen architectural services, construction administration, and business management functions with Facilities, Design and Construction.
- Increase participation and strengthen relationship and support for University community functions and committees.
- Implement regular interaction and consultation between the organization and Deans, Directors and Department Heads throughout the University and the Arizona Health Sciences Center.
- Establish a semiannual program to provide discussions with ASUA Student Body Officers.
- Establish an organization Employee of the Quarter recognition program.
- Continue recognition of the "Idea of the Quarter" program.
- Continue to support the University's Award for Excellence and Billy Joe Varney Award programs.

Facilities

- Obtain additional space for maintenance and administrative units.
- Enhance utilization of warehouse/stores areas.

- Expand shops area.
- Remove custodial storage shed, construct new office/storage facility.
- Improve campus facilities through organized/prioritized use of building renewal funds.
- Establish a University-wide quality assurance program for custodial service.
- Establish a maintenance historical file and identification programs for all University building roofs.
- Identify and integrate fund sources and expenditures into the annual budget program process.
- Implement a building inspection program to support the annual work plan.
- Develop a quarterly program for submission of all Construction Decision Packages and integrate into an organizational priority list.
- Improve campus appearance through promotion of exterior signage program.

SCHEDULES

The final and sixth part of the Business Plan is called the schedules, which includes financial and organizational. The schedules are the key to examining where you have been and where you want to go. The financial and organizational schedules should be prepared for each of your preestablished business units. These schedules identify past, present, and future financial operations for those units which will be monitoring the activities of their business unit. An examination of schedules reveals the following examples.

SCHEDULES

Financial

The financial schedule will be the dollar translation of the Business Plan's Mission Statement, Strategic Objectives, and Strategies. It will become the current-year budget and will of necessity be developed after the Mission Statement, Strategic Objectives, and Strategies have been prepared. It will include two prior years' historical data, an estimate of how the current year will turn out, and the projection for the upcoming year to implement the Business Plan. The format for the Financial Schedule follows:

Actual			Projected	
88-89	90-91	Description	91-92	92-93
		Revenue		
		Personal Services		
		Operating Expenses		
		Capital		
		Net position		
		Beg. Fund		
		End. Fund		

Organizational

An integral part of the Business Plan is organizational planning, as this is the process by which the business ensures that it has the organizational structure and human resources to meet its strategic objectives. It is the way of bridging the gap between the human resources available today and those needed tomorrow.

This section should include:

1. An organizational chart with just titles of the business as it currently exists.

In this chart, titles and last names of the individuals currently occupying these positions should be so indicated.

2. An organizational chart of the business as envisioned for the upcoming FY in order for the unit to accomplish its strategic objectives.

Please ensure that the organizational chart accurately reflects personnel included in your past-year budget, as well as personnel changes forecast for current and future years.

SUMMARY

A Business Plan is exactly that, a plan. However, the plan will cause you to look at your organization in a variety of operation categories; cause the suspension personnel in your organization to examine their current level of activity, dedication and, in some cases, real contribution; cause your customer to view you as an organization that is more effective and efficient, and cause you as the manager to know where your organization has been, where it is today, and where you want to be tomorrow.

Castles and Sheds: Facilities Management at a Czech University

Jan Winkler
Director of Administration
Charles University

1. Foreword

The situation in Czechoslovakia is changing dramatically. Society as a whole and all its institutions are seeking a new way of existence in an entirely new political, social, and economic environment. The higher education system and its individual parts - universities - are no exception. Their situation is, nevertheless, more complicated than, for instance, that of industrial companies or government organizations.

The prestigious status of higher education means that individual universities are subject to considerable public interest. They are expected to represent a model of socially desirable behaviour and to be the source of alternative thinking. Universities should be able to articulate problems even before they have arisen. They should be an undying source of ideas and unexpected solutions. On the other hand higher education institutions are not immediate producers of material value and therefore under economic pressure they can easily lose their place among the institutions which society is willing to support - financially or otherwise. There is a constant battle between the acknowledgement of higher education as a source of future prosperity (a long-term investment), and a view of the universities as non-productive "parasites" which, with the present scarcity of resources, should await their turn.

Historically this situation is no novelty. There were several periods of economic distress during the six-hundred-year history of Charles University, and some kind of solution was always found. What is new is that *we* are in this situation, and it depends on us whether we are able to learn to cope with it fast enough, and whether our passage through this period is as brisk as possible.

In the following notes I would first like to give a general description of the present state of our institutions of higher education - as a result of the preceding years. Then I shall present some data, facts, and figures concerning Charles University. Last I shall mention the main problems which confront us at present and our current suggestions for their solution.

2. Our Inheritance

These days we often talk about the last forty years of "building socialism" and about their consequences. If we add to these the World War Two years with the Nazi occupation of Czechoslovakia we can see more than a half-century of bondage and the devastation of both our spiritual and material life. The years between the end of the war and the communist putsch (1945 - 48) were too short a period in which to consolidate democracy and to re-establish the habits of free citizens. Convalescence after such a long time is not easy and will not be short.

2.1. Buildings and Sites

The immovable assets of higher education institutions shared the destiny of all property under socialism. They were nationalised and their management was centralised. It is true that the communist regime was relatively generous in handing out stolen "nationalised" property to socially beneficial institutions in the field of health, education and culture. The universities already in existence at that time acquired a number of properties which they would otherwise never have dreamed of obtaining. In this way Charles University acquired some buildings in the centre of Prague and a large chateau in Northern Bohemia. The Czech Technical University obtained another chateau not far from Prague, and several palaces in the city. However, this was considered sufficient to solve the space requirements of those historic institutions in the long term and their further development was given no more attention. Greater financial support was directed toward newly established universities, as a rule focused on narrower vocational subjects (agricultural, chemico-technological, mining and so on). For these, new campuses were often built which took into consideration the need for laboratories, provision of accommodation, sports grounds and other facilities. Those new universities became a "shop window" to show off the socialist concern for higher education.

Centralised control manifested itself in the absolute subordination of the development of universities to the development of whole regions or towns. This approach could have certain positive results so long as the 'generel' (general plan) was itself the result of mature thought and conception. However, under the old regime the plans of the experts were often subject to interference and the incompetent influence of political functionaries. And so new educational buildings can today be found either immediately beside main roads or, on the contrary, very far from town centres and without any suitable transport link.

The building of new educational establishments was also subjected to Marxist economic principles and so institutions preparing specialists in heavy machinery, smelting and mining are more extensive than really necessary. In line with the Soviet model, technical schools were given preference because it was expected that these would contribute most to "socialist industrialisation". Teaching in economics, reduced to Marxist political economy, was concentrated in two economic universities.

The Humanities were, on the other hand, undervalued or even deliberately assigned to the most remote locations, as dangerous. A typical example of this approach was the handling of the theological faculties, where they survived at all.

2.2. Staff Quality

In this article I shall not evaluate the level of the academic community of teachers and researchers. I would only like to stress the fact that under the old regime research activities at the universities were markedly limited. Fundamental research was transferred to the institution created according to the Soviet model - the Academy of Sciences. The Academy's mostly new institutes were given up-to-date equipment. Their employees were not usually burdened with teaching responsibilities and, on the other hand, the university teachers were not forced to undertake intensive research. Applied research was then carried out by institutes belonging to government sectors or big companies.

I would, however, like to consider the quality of management officers and the staff as a whole. "The right to work", guaranteed by the socialist constitution, led in the long run to a decline in professional morality and responsibility. The labour market ceased to exist and the ability to work lost its character as a product to be nurtured and perhaps sold at an advantageous rate. Efficiency, creative organisation and other capabilities ceased to be the criteria for judging benefit to society, and for establishing levels of reward. The link between performance and pay disappeared and, with it, motivation vanished. A crucial group of employees lost interest in professional development and substituted loyalty to the regime for real abilities at work. Another large group of workers became entirely indifferent and concentrated on creating the illusion of industriousness. If anybody showed managerial or entrepreneurial spirit, he soon became suspect and was forced either to engage his abilities in the service of the state or to give up his ambitions.

Only a very small number of people responsible for managing universities had gone through any practical managerial course or even theoretical study in the field. Their qualifications were as a rule political loyalty and willingness to carry out instructions "from the centre".

2.3 Technical Equipment

At the end of the forties Czechoslovakia was among the most economically developed countries of the world. Soon, however, especially due to a deliberate slowdown of development aimed at levelling out the economies of socialist countries (East German and Czech economies had to be consistent with those of Bulgaria and Mongolia), Czechoslovakia began to lag behind the Western world. Naturally, institutions of higher education were not exempt from this process.

Most striking was Czechoslovak backwardness in the field of computer technology. Indeed, even at the end of the fifties, the communists proclaimed that cybernetics was a bourgeois fraud. and that Norbert Wiener was a false prophet. And so only at the end of the seventies did universities begin to get equipped with - mostly Soviet - computer technology. The barrier to imports from the West to the communist bloc meant that it was impossible to buy the top technology from developed countries. Moreover, import was limited by the continual shortage of convertible currency. And therefore to this day the majority of universities do not have a fully equipped communication and information network. The computer equipment which the universities managed to obtain was very diverse, differing according to individual possibilities for the purchase of PCs. Only after 1989 has it become possible to adopt a more systematic approach. Today most workplaces have basic equipment and an integrated information system is being built.

The situation is similar in relation to various laboratory and measuring equipment. Charles University, with its five medical faculties,is a "superpower" in turning out doctors well qualified from the theoretical point of view, but it cannot often provide them with practical experience of sophisticated medical technology. Rather better facilities were given to the technical schools, and, as far as universities were concerned, to departments of physics, particularly nuclear physics, since this was regarded as a strategic, economic and political priority.

A glance at the catalogues of Western firms offering machinery and equipment for the maintenance of buildings and other facilities, causes fits of depression in the managers of our halls of residence and other maintenance staff. Our contemporary economic situation means that they will have to wait a long time for such equipment. Similarly, our transportation resources are insufficient to our needs although leasing arrangements offer us a short-term solution to this problem.

3. Charles University: Facts and Figures

Charles University is the oldest university in central Europe and one of the oldest in Europe as a whole. It was founded in 1348 by the Emperor Charles IV in Prague, at that time the capital of both the Czech lands and the Holy Roman Empire. The university has had a most interesting and eventful history. However, from the point of view of the management of facilities this history has provided us with only a few buildings, of which the oldest is Charles College. For some time, when the Jesuits were playing an important role, the university was sited in the extensive Jesuit college. A more significant period in the expansion of university premises arrived with the development of natural and medical science in the second half of the nineteenth century.

3.1. Students, teachers, staff

Today, if we count all forms of study, there are about 30,000 students at Charles University. Their teaching, in sixteen faculties, is the responsibility of more than three thousand academic teachers including senior professors. They, together with administrative and technical personnel, make up the university's 7.6 thousand employees. Approximately 24 thousand students are registered as full-time, and demand for these places is rising markedly with more than thirty thousand candidates applying this year. The fact that until recently Charles University was the only traditional University in the Czech lands and the prestige of the institution mean that roughly 10 thousand students come to Prague to study. The university can offer approximately eight thousand beds in halls of residence.

The head of the university is the rector, an academic elected on a triennial basis who can be re-elected for a further three-year period. The rector appoints prorectors for various areas of academic management, for example for student affairs, for science and research, for development and for foreign relations. The rector's deputy for the management of university finance, administration and maintenance is the quaestor. This title is a Latin one, which traditionally designated the member of the community of scholars who was entrusted with the management of the financial resources of the university. Today the quaestor is the head of the administration with many responsibilities and a considerably extended sphere of competence. In contrast to the academic representatives, the quaestor is a state officer.

The rector is elected by the university's academic senate. The senate also approves the rector's nominations for prorectors and its agreement is required when a new quaestor is appointed. I will say more about the composition and functioning of the senate later.

3.2. Buildings and Facilities. An overall view

Charles University uses 260 properties (buildings and other

facilities) located throughout the Czech lands and owns almost 200 of these. In Prague alone it manages 150 properties, which are scattered all over the city. These facilities are of very diverse character: from large Gothic town houses and baroque palaces to concrete high-rise buildings.

The administration and rector's office are located in historic buildings in the city centre. The heart of the university is the Magna Aula, where university celebrations and formal occasions take place in a house older than the university itself. The faculties are located in very diverse buildings in many places in Prague.

Three faculties located in other towns also belong to the university: the medical faculty in Plzeň and the medical and pharmaceutical faculties in Hradec Králové. This arrangement, which causes many administrative and maintenance complications, has its roots in history. During the Second World War, all institutions of higher education in Czechoslovakia were closed for more than five years. After the war it was necessary to find a solution to the scarcity of qualified people, especially doctors. This was the reason for the decision to establish further medical faculties outside Prague. Despite the fact that, as I have already mentioned, the arrangement brings with it a series of difficulties, it seems that the association of these faculties with Charles University proved a fortunate decision for the standard of medical care in Czechoslovakia. In contrast to the independent pedagogical faculties, which never managed to pull themselves up from a provincial, very average level, these medical faculties are of university quality.

In addition to its teaching capacity the university manages a range of other facilities: on the one hand sports centres - skiing centres in the mountains and water-sports centres on the river, and on the other hand centres of preparatory training for foreign students. Two such centres are located in country chateaux, and are in relatively good condition. In view of the rapidly increasing demands on our resources, we will have to consider transforming these sites into self-financing conference or study-centres. Outside Prague the university also has library deposits, some in chateaux and others on out-of-use factory premises.

Altogether, the university properties are extremely diverse in character.

3.3 Teaching capacity

At present we use for teaching purposes former monasteries, noble palaces, nineteenth-century patrician houses, once-luxurious family villas and old army barracks. The construction of

facilities specially designed for university activities started only at the end of the nineteenth and beginning of the twentieth centuries. These facilities, generously proportioned by the standards of the time, are today used by the Faculty of Natural Science and the First Faculty of Medicine. A marked upswing in the fortunes of the university was brought by the Czechoslovak national independence achieved in 1918. In the Twenties and Thirties the most substantial and valuable buildings were constructed: the Law and Philosophical Faculties and the Medical Institutes at Albertov. The most recent properties are the buildings of the Mathematics and Physics Faculty and the student halls of residence.

Two of the medical faculties rent teaching space in hospitals. The theological faculties are teaching in buildings belonging to their churches. The Faculty of Physical Education acquired, after 1989, the properties of the old police barracks which the communists had already turned into the Communist Party's Political University. These facilities are the closest that we have to an American campus.

The new Faculty of Social Science has to operate in the least favourable conditions, since it has no decent buildings of its own and teaches in various unsuitable or leased rooms. The Pedagogical Faculty, which has well equipped facilities of a campus character in a little town on the outskirts of Prague, is unable to cope with the poor transport link to and from the city. For this reason its staff prefer to teach in the unsuitable quarters provided by tenement houses in the centre of Prague.

3.4. Halls of Residence and Cafeterias

The first student hostels were built at the beginning of the century, the majority of these established and run by wealthy individual sponsors and various fraternities or political parties. Usually, however, such hostels would provide no more than a few dozen beds because up to the Second World War students had little problem finding private lodgings. With the marked growth in the number of students after the war and the changing social and political situation, the responsibility for building halls of residence was taken over by the state. It became the duty of the university to look after students in matters of accommodation. And so today Charles University has at its disposal several thousand beds in a series of modern buildings.

The major problem, which also applies in the case of cafeterias, is the unrealistic nature of the aims for which these facilities were built. While teaching is concentrated in the centre of Prague, the halls of residence and often even the cafeterias are located on the periphery. Students therefore waste a great deal of time travelling to and fro and they overburden the transport system unnecessarily. A typical example of the result of central

planning is the situation in one outlying part of the city where an original scheme envisaged the building of a new faculty area including halls of residence for five thousand students. The first facility to be constructed was a cafeteria capable of producing four thousand meals. Today over a thousand students have accommodation in the locality, but, understandably, they do not return from the centre of the city for lunch. In view of inadequate financial resources and changes in area planning, we cannot count on being able to finish building the whole complex. And so the cafeteria is utterly empty even at 12.00 a.m. while in the centre we are short of 3 - 5 thousand student meals.

4. Our main problems today

Present conditions have opened up for the university the chance to make independent decisions about its future. An autonomous university has the right to evolve its own solutions to its problems and to determine an agenda of priorities. But this freedom may be a poisoned chalice in a situation in which individuals and social institutions are only starting to learn how to move in that unknown sphere of freedom. It is a doubly problematic gift since almost everything now requires a conceptual restructuring. This makes heavy demands on the inventiveness and energy of responsible staff, while there are unfortunately very few experienced, capable and yet uncompromised people. And it is a triply demanding gift in a situation in which a whole range of things have been neglected and require a large financial investment while few such resources are available.

4.1 State of the Buildings

Given the quantity of properties belonging to Charles University and the marked differences in the purpose and design of the buildings, it is hard to make any general evaluation. Overall, one can say that in the last few decades the maintenance of old buildings has been neglected, and the new buildings are not of very good quality. The properties in the best condition are those which were protected as historical monuments. But there are not many of these.

The properties of Charles University can be divided into three categories according to their state of repair:
a) In a good state of repair on the assumption of good maintenance in the future and partial modernisation.
b) In a basically acceptable state with some disastrous features such as worn-out plumbing or sanitation problems.
c) In a completely disastrous state of repair - the genetic garden and the pavilion for breeding laboratory animals at the Faculty of Natural Science, the Renaissance palace "At the Green Tree" and two other properties belong in this category.

The buildings put up at the turn of the century require general reconstruction, especially the reconstruction of water conduits, electrical and gas systems and such like, and the replacement of building features with a short life (roofs, floors, windows). Approximately 30% of university properties are in this poor state of repair. A further large proportion of our property was built some twenty of thirty years later and such facilities are also reaching the stage of needing extensive repair. Buildings from the most recent decades are showing signs of their poor construction, and some are not yet free of problems which were the subject of complaints even during the original period of the builders' guarantee.

At the present time we are completing a survey of the condition of all our buildings. The next step will be to establish priorities in the use of our inadequate resources for reconstruction and modernisation.

4.2 Removal of property injustice: the impact of restitution

The positive direction of our current political development is accompanied by an effort throughout society to redress the injustices committed by the old regime. An aspect of this endeavour is the removal of property injustice. Laws were passed to give former owners the right to apply for the return of properties that were nationalised on the basis of the unjust laws or unlawful practices of the communist authorities.

This trend is undoubtedly just but nevertheless has a negative impact on the activities or even existence of a range of socially beneficial institutions. It affects health care, cultural and educational institutions. 20 000 m^2 of Charles University property, representing more than the average area used by one faculty, are threatened by applications made by former owners. Although the government is protecting the public interest by imposing an obligation on old-new owners to lease property back to institutions, such owners will apparently be able to get vacant possession simply by demanding high rents.

The situation is a good illustration of what I would call the philosophical point that there are evils that are impossible to confront with complete success. The enduring injustice of the last decades has often taken the form of an apparent good which it is impossible to remove without causing some new evil.

4.3 Cooperation with Foreign Investors

Some hope of obtaining resources arises from the marked interest of foreign investors in taking a share of the cost of reconstructing architecturally valuable property in the centre of the city - in exchange for the partial use of such property. The establishment of joint projects is, however, blocked by the maze

of regulations which limits the university's freedom to dispose of its immovable assets and the funds which it receives from the state budget. It cannot act as if it had full rights of ownership. Often even the academic community itself opposes the long leases which an investor will usually demand. Moreover, the very idea that teachers and students should leave buildings which may be old and dark palaces but which are situated in the city centre, and should move to campuses on the periphery, has few supporters in the academic community.

The protracted nature of the decision-making process in the academic senates is a problem which often puts off impatient potential partners. And conversely, our inexperience and fear of dishonest dealing by foreign partners hinders the development of this form of cooperation.

It appears that providing for the reconstruction of the already mentioned palace, "The Green Tree", one of the most outstanding Renaissance buildings in Prague, would be a relatively easy task. The property is not used by any faculty. It has a very attractive location and would be an ideal place for the construction of a university conference centre. The one difficulty is the cost of reconstruction - approximately USD 10 - 12 million. UNESCO promised support, but without substantial assistance from other sponsors there is no guarantee of success.

4.4 The future of halls of residence and cafeterias

The 8000 student beds in halls of residence, and a range of cafeterias providing three meals a day are an integral part of the university. This was not always the case. Before the war students had, to a much greater extent, to arrange for their own board and lodging and the university's activities in this respect were small. Today the question of whether it is desirable for the university to continue to respond to these needs has arisen again.

In the interests of making the financial system more transparent, the Ministry of Education is trying to replace the subsidisation of the institution's provision of board and lodging by an arrangement of direct payment of grants to students. It is difficult to foresee the impact of this change. The students, on the other hand, are fighting for the greater independence of the halls of residence without realising that these are the property of the state and without understanding how the maintenance of facilities works.

A convenient plan would be for the university to provide a certain, smaller number of beds for the accommodation of first-year students and foreign students. The greater part of the facilities should be maintained by special organisations of the German Studentenwerk type which could coordinate the use of

accommodation across the whole city. In addition, a significant role will be played by the necessity of gradually raising accommodation fees as a result of the abolition of state subsidies. It seems that a situation will occur in which placements in halls of residence will not be made on the basis of subject of study or faculty, but according to the financial resources of the student.

In any case, it will not be easy to ensure the functioning of a somewhat complex system of halls of residence, in which, in the past, the old facilities were run on funds provided by the new and better facilities.

4.5. Autonomy versus anarchy

I have already mentioned, at several points, the difficulties involved in the transition to a democratic, decentralised way of directing higher education. A strong general tendency toward democratising life, and increasing participation in the management of public affairs has led to change in the method of directing the university. Individual faculties have obtained not only academic but also legal independence from the university. In addition to the elected rector, an academic senate composed of representatives of the faculties directs the university. What is more, until now the students have had 48 percent of the representation in this senate. It is not easy for a more than sixty-member decision-making collective to react flexibly in the direction of the university, even though it aims to exercise as wide as possible an authority. Moreover, the responsibility of members of senate is nowhere formally defined.

On the other hand, of course, a restrictive financial policy puts the emphasis on a professional, managerial style of administration. However, as a result of past experience professional managers - even when these are new people - are the object of much mistrust. The implementation of new conceptions and questions about the development and division of financial resources are, therefore, the subject of quite demanding and complicated negotiations. This, however, is only a childhood disease which we will grow out of.

4.6 Recruitment of Professionals

The last problem to which I would like to devote at least a little attention, is that of staff. It is not easy to keep quality specialists - managers, officers and skilled labour - in this time of the vast expansion of private enterprise. Many are setting up their own firms and others are finding more lucrative employment in foreign enterprises. The only thing that we can offer is work at a very prestigious institution.

After a certain time, however, the situation will stabilize and -

especially with the rise in unemployment - and people will begin to value relatively secure work. New methods in recruiting staff, up to now infrequently used here, will also come into play. It would be a good thing, in the meanwhile, for us to reform our personnel department from an organization which simply keeps staff files to a workplace which is concerned with the professional development of employees, a good wage policy and the creation of conditions conducive to high work performance.

5. Conclusions

I realize that this contribution is more a description of the situation at one university than a sparkling account of interesting methods or new approaches. But such is our situation. We are at the stage of analysis and self-examination. We are gathering knowledge and experience from outside sources. We do not have much time and we must hurry. I believe that our contributions will soon be full of interesting experiences and unusual solutions.

For the moment I can only contribute our basic experience. It is possible to destroy, to deform or to damage almost everything: Buildings, equipment, morale and morals, interpersonal relations... Yet the human yearning for a meaningful life with a spiritual dimension is indestructible and reasserts itself in reaching for a full life. In this there is hope for our country, for America and for the whole world.

Castles and Sheds: Facilities Management at a Czech University

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"Make/Buy" Competitive Procurement Program

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Director, Work Management

Richard Fowler
Director, Facilities Operations

William Stauff
Director, Business Operations
University of Virginia

I. INTRODUCTION (William D. Middleton)

Throughout higher education, and the public sector generally, there has been a growing interest in the idea of privatization as a means of reducing costs and improving quality of support services. The perception - and sometimes the reality - is that a public sector or institutional work force is inefficient and non-responsive. We should let the private sector, and competition, work to assure that services are provided at the lowest possible cost and in the most responsive possible manner.

The Federal government has had privatization programs for years, and many state and local governments have followed suit. In Virginia, our former Governor, Gerald Baliles, several years ago mandated a "make/buy" competitive procurement program. This required that we compare the cost of services provided in the public sector with the cost of contracted services.

Even if it isn't required, shouldn't we as prudent managers be doing this as a matter of course?

At the University of Virginia we have given much thought to just how we could best carry out such comparisons, and have developed a program based upon the framework provided by Governor Baliles's "make/buy" executive memorandum.

In developing our program we reached one essential conclusion: The issue is not privatization versus in-house performance; the issue is competition.

David Osborne, who has done a great deal of study and writing on improving efficiency in government, has established as one of his basic guidelines: "Whenever possible, inject competition into public service."

Osborne quotes the city auditor at Phoenix, Arizona, Jim Flanagan, who has discovered there is no truth to the old saw that outside business is always more efficient than government. The important distinction, says Flanagan, is not public versus private, it is monopoly versus competition.

"Where there is competition," says Flanagan, "you get better results, more cost-consciousness and superior service delivery."

In developing our program in Virginia, we didn't want to just trade an in-house monopoly for a contractor monopoly.

Think about it: Isn't this what we often do when we contract out a service?

In principle, our "make/buy" competitive procurement program is one under which our internal work force competes for facilities projects or service contracts against private sector contractors. In establishing the program we had three principal goals:

1. We wanted to assure ourselves, and our customers, that facilities projects and services are being provided at a satisfactory level of quality and in the most economical manner available.

2. We wanted competition to act as a force to enhance the cost-consciousness, efficiency, and productivity of our internal work force.

3. Similarly, we wanted the force of greater competition to enhance the competitiveness of outside contractors.

We have established as basic policy that we will make the broadest possible use of competitive "make/buy" solicitations for all forms of facility services, whenever

feasible. To do this effectively, we recognized that some fundamental restructuring of our organization and revision of responsibilities would be necessary. The principal changes have been:

1. Our work management department has become our "program manager" for most of the University's facilities maintenance and services budgets allocated directly to facilities management, and acts in a similar capacity for all of our reimbursable customers. Their charge is simply to get the work done for the lowest possible cost at an acceptable level of performance.

2. Our operations department has been recast as an "entrepreneurial" unit which is expected to compete for work much like any private sector business. They are now responsible for establishing pricing and schedules for work performance, and are fully accountable for the financial results.

3. Our business operations unit has established a comprehensive system of financial responsibility centers throughout the facilities management organization. Each such center is held accountable for the profit or loss of their "make/buy" activities.

We initiated this "make/buy" approach at the University of Virginia not quite two years ago, and have now completed more than $2 million in procurements under this program. Today we'll give you an overview of how we have modified the organization and established procedures to effectively conduct a competitive procurement program, we'll summarize the principal results to date, and will offer some advice based upon this experience for anyone who might be contemplating a similar venture.

Jay Klingel, director of work management, will first discuss the procedures through which his office functions as program manager for facilities projects and services, the several different procedures we've established for our "make/buy" contracts, and our procedures for evaluating bids or proposals and administering "make/buy" contracts.

Next, Dick Fowler, director of facilities operations, will discuss how we've reorganized our principal operating department to make it a more businesslike entrepreneurial unit, how we are using financial responsibility centers as a way of providing management incentives, and how we have begun to change the culture of the organization to provide a greater emphasis on productivity and competitiveness.

Third, Bill Stauff, our director of business operations, will talk about the formulation of the responsibility center concept; our approach to planning, budgeting, reporting, and controlling under this concept; and our cost accounting system.

Finally, we'll talk a bit about the effects of "make/buy" procurement, both as perceived by our customers, and as we have seen it inside the organization, and we'll summarize the results to date and offer advice from our experience for others interested in this competitive procurement approach.

II. "MAKE/BUY" PROGRAM MANAGEMENT (Jay Klingel)

The program has required some fundamental changes in our facilities management organization. As mentioned, the work management office has become more of a program management group.

Our job is to get the maintenance and improvement work completed at the lowest possible cost at an acceptable level of quality. We manage maintenance programs and budgets by controlling the flow of work through a series of "make/buy" comparisons. The work management group no longer has the responsibility to "keep the shops busy", but to do as much maintenance for the money as possible through competitive comparisons.

As we began to implement our ideas on the "make/buy" program, we realized that contract development, or preparing the procurement specifications, would be the first key to a successful program.

The position of service contracts manager was established as part of our work management office. The duties of this position include specification development, procurement coordination, contract administration, and reporting. We were fortunate to attract a candidate with procurement experience in the public sector, bringing the skills and knowledge necessary to establish a consistent and accurate program of writing specifications. By

combining the technical expertise of operations personnel and procurement experience we feel we have been able to develop solid and equitable specifications.

The types of contracts we have established vary from long term (multi-year) service contracts, to yearly unit rate agreements, to spot or lump sum purchases for specific projects. These different types of procurements allow us to compare prices of in house and outside contractors in three distinct ways:

1. Long Term Service Contracts. These contracts are based on providing a basic service on an annual or multi-year basis. Examples of this type of contract for which we have completed "make/buy" comparisons based on direct competition include custodial services, elevator maintenance, grass mowing, and fire detection and inspection.

2. Unit Rate Standing Contracts. These contracts are awarded to outside contractors for yet-to-be determined services based on a unit rate. Once contracts are in place we are able to make an indirect comparison of in-house versus contracted costs for a specific job. Examples of this type of contract include interior paint, suspended ceilings, tile floor, and concrete sidewalks. If our Operations crews are able to provide services at a lower cost than the contract unit rate, the work is assigned to them through that method of indirect comparison.

3. Spot Procurement. These contracts are awarded through a direct competitive bids for a specific project. Examples would be a renovation project, painting the exterior of a building, or moving a department from one facility to another.

Through these three basic procurement methods we feel we have built a foundation to eventually compare costs for virtually the full range of services provided by our Facilities Management organization.

We are obviously unable to develop comprehensive specifications for all services at one time. We have tried to identify those items that would result in the most savings from a competitive comparison. Services that had been traditionally contracted that we felt our own

forces may be able to accomplish and, as well, those services we normally provided with in-house forces that were not competitively priced, were targeted first.

As a state institution, all of our procurements must be in accordance with the Virginia Public Procurement Act. For all our directly competitive comparisons we ask that our Operations Department abide by the same rules as their competition.

The level of quality must be emphasized in the specification. While the cost of services is foremost in many of our minds, especially in our current financial climate, an acceptable level of quality must be maintained. Describing that acceptable level of quality, especially for a service, is perhaps the specifier's most difficult task.

Evaluation of Bids/Proposals

After the need is developed for a particular contract, a solicitation must be issued to both outside contractor and in-house forces. The bid or proposal from our in-house forces is treated almost identically as bids from the private sector. Facilities Operations must develop a bid price based on solicitation requirements and submit it to the same office which issued the solicitation to the private sector. Once bids are received, the in-house bid is compared to the lowest responsible/responsive bid from outside contractors. A "make/buy" analysis is completed based on these two bids. The solicitation requirements may need to be clarified to assure that all parties involved in the procurement have a full and complete understanding.

When evaluating bids/proposals within the "make/buy" program, researching the capabilities of both in-house and the outside contractors is an essential element when making an award. One should take the time to do the necessary research to determine if the apparent low bidder has the capabilities to complete the contracted work. Contractor or in-house capabilities to be researched might include:

- Financial Data/Fund Availability
- Available Technical Equipment/Personnel
- Production/Delivery Capacity
- Quality Assurance Program

After researching the capabilities of Facilities Operations as well as the outside contractor, an award is

made. Various types of information about the award should be provided to both end user departments as well as Facilities Management personnel. Such information would include; what type of contract was awarded, for how long, to whom, and any "make/buy" cost analysis data for key management personnel.

Contract Administration

The Work Management Department has been delegated the responsibility to handle contract administration. This includes the determination of what types of services are to be analyzed under the "make/buy" program, developing specifications, reviewing bids when received, completing a "make/buy" analysis, recommending award, and performing inspections on contracted work.

Work Management is also responsible for coordinating contract work and performing a final inspection on contracted work. This includes the establishment of a tracking system on all contractual work, showing work schedules for each particular contract, establishing project performance dates, and performing final inspection of projects when completed. Whether work is completed by in-house forces or by outside contractors, a quality assurance program should be established to monitor performance and to offer solutions to problems. Work Management monitors and assesses contractual solutions to assure that they are appropriate to the problems and competently implemented.

III. **COMPETING UNDER "MAKE/BUY"** (Richard Fowler)

Facilities Operations reorganized the maintenance and renovation shops into individual responsibility centers (cost centers). We used zero based methods to establish our budgeting and spread appropriate divisional, departmental and overall assignable Facilities Management overhead to the individual cost centers. We then fine-tuned the billing rates of selected cost centers as required to enhance their competitiveness.

In "make/buy" comparisons we compete head-to-head with successful local contractors. An examination of examining fourteen recent "make/buy" comparisons for our renovations shops during the 1991-92 time frame reveals that Facilities Operations was low bidder on nine projects at an average of 15% below the next low bidder. However, in this tight economy we have found that some contractors were providing loss leaders just to make payroll. Our

renovations superintendents have been actively courting project managers and customer facilities representatives to learn of additional work opportunities.

Some of the problems associated with the "make/buy" approach include a diminished control of our work load. Our backlog of work has been reduced significantly because the decision point in determining when we are awarded projects has been delayed until very late in the life of a project.

Additionally, the recessive economy contributed to a paucity of projects of any sort to be accomplished. Due to our competitive environment, we have been forced to reduce the amount of advice, pricing and other "free" services we previously provided to others.

We have increased our productivity awareness and have actively marketed our services to the University community. We have additionally solicited work from other state agencies and local governments. This has provided opportunities for us to perform sign making, asbestos removal consulting, furniture renewal and establishing recycling programs for local school systems. We have started putting on "dog-and-pony" shows to demonstrate our capabilities and to foster the thought that work could be cost-effectively accomplished by us during this period of diminished activity.

We have additionally begun a series of discussions with customers concerning performing design-build projects using our own staff and teaming up with Facilities Planning & Construction Department to buy their professional design services for either a piece of the action or on an hourly rate basis. We feel that we can best serve our customers by striking a deal based on a guaranteed maximum price with a negotiated shared savings based on perceived risk to both parties. This procedure not only makes us an advocate for the customer since we both have a strong interest in bringing in a project as cheaply as possible but it takes much of the guesswork out of the composition and timing of our backlog of work, as well as puts a project on an expedited track.

The "make/buy" approach has been a little scary due mainly to the overall economy rather than due to the competitiveness of the system. It has caused the adrenalin to pump a little faster during our work days.

IV. **RESPONSIBILITY CENTER ACCOUNTING** (William Stauff)

Cost center restructuring is necessary when a company reorganizes. An APPA evaluation team and an independent facilities consultant organization made recommendations resulting in changes to our organization. Cost center restructuring followed based on a three-fold harmony of establishing the cost system with budgets in sync with the organizational structure (Figure 1).

We reviewed our organization and established responsibility units for each service that we provide. We designed the system to assess the achievement of each profit center including that of the manager in control of its operation. Plumbing supervisors now take on an additional task as fiscal manager, as well as a service oriented manager. Up to this time, forty million dollars ($40,000,000) was controlled by few and spent by many.

Planning, budgeting, reporting, and controlling is now by profit center. The general theory is to delegate responsibility for managing expenditures to the supervisor at the point where the costs are generated. Decentralization of accountability is now in place. The first quarter review of fiscal year 1991-1992 was an interesting phenomenon. Many of the cost center managers' profit centers were in the "black." In many cases their revenues were down, but the new reporting enabled them to see their bottom line and thus hold back discretionary expenses. So far it's working!

Zero-based budgeting is now in place. Ronald Blickhahn, who applied zero based budgeting at Duke, emphasized: "This system requires each function, activity or program to be justified on the basis of its own merit to the organization. Zero-based budgeting calls for resource allocations to be committed only after each activity or program is analyzed and justified from scratch or 'based' zero."

Thirty-three cost center managers prepare budgets which are reviewed and approved in accordance with established organizational goals and objectives.

The cost accounting system is part of the Facilities Management system (FMS). David J. Gojdics from Emory University, talks about the need for a university's facilities management system to be "the primary planning and control tool of the physical plant department." The system that the University of Virginia is putting in place

allows the facilities management budget structure to be arranged in cost centers that match the various functions or shops. The system has the capability to summarize cost and budget data in the NACUBO/APPA reporting formats (Figure 2). The accounting system integrates with the facilities management system and interfaces with the administrative mainframe for uploading and downloading. The system allows users on-line access and query capability.

V. **The Results of "Make/Buy"** (Jay Klingel)

We felt it was important to track the progress of the "make/buy" program both in terms of the number and types of procurements as well as the financial impact. We are tracking the cost differential between Facilities Management's proposals and the low private sector proposals. The difference is not necessarily a savings. For instance, we have traditionally contracted pest control services. In a "make/buy" procurement, if our in-house bid was $10,000 higher than the low contractor, we haven't saved $10,000. But, on the other hand, if the in-house bid was $10,000 lower, we have, in effect, "saved" that amount due to injecting competition. Thus the actual savings realized by the program represents the differential of proposals for those services for which the traditional provider changed as a result of competition.

We have been tracking the financial results of "make/buy" procurements since January 1991. Through March of 1992 a total dollar volume of $1.99 million had been awarded as a result of "make/buy" comparisons. Of that total, 75% has been awarded to in-house forces. The cumulative differential of in-house bids and the low private contractor bid is $.59 million. Attached is the reporting format we've developed, indicating financial information through the third quarter of fiscal year 1991-92 (Figure 3).

Effects on the Organization

We've mentioned the move in our organization toward a more entrepreneurial attitude and approach by our operations area. The "make/buy" program forces this approach due to the fact that as more and more basic services are competitively procured, the operations group must become more innovative, more business-like in order to acquire the work to recover their expenses.

We found early in the program that some of our shops, because of rate structures, were unable to compete with the private sector. This resulted, positively, in a lower price for those services.

Negatively, employees in these shops were unable to obtain work. Ultimately some positions were terminated and these employees were either transferred or, in some cases, laid-off. So, there are admittedly morale implications due to the "make/buy" program.

Many employees feel threatened by the possibilities that "make/buy" comparisons present. There are constraints in the Virginia State personnel and procurement systems that limit flexibility in many cases. However, we are finding that those individuals that are confident in themselves and their work are welcoming the challenges that the program offers. Those of us who have heard that "Facilities Management takes too long and costs too much" welcome the opportunity to compete with private contractors, and demonstrate the cost effectiveness of public sector work.

The assumption that private business is always more efficient than government or public work is not accepted in our organization.

We feel that appropriate levels of competitive comparisons will not only reveal where efficiencies currently lie, but will enhance efficiency in both the public and private sector service providers.

One of the key differences between public and private sector business is, of course, profit motivation. Through competition, the private sector earns profit. The public sector, traditionally, has no profit motivation. By combining the concepts of competitive comparisons for services and facilities endowments, the public sector can make a case for earning not a personal profit, but a public profit. By confronting the bureaucratic tendencies of complacency and centralization, we hope to become less of a bureaucratic public organization and more of a competitive entrepreneurial public organization.

A CLASSIFICATION OF
ACCOUNTS FOR OPERATION AND MAINTENANCE OF
FACILITIES MANAGEMENT

I. MAJOR ACCOUNTS:

1. ADMINISTRATION
2. ARCHITECTURE AND ENGINEERING
3. UTILITIES
4. MAINTENANCE AND OPERATIONS
5. OTHER SERVICES
6. MAJOR REPAIRS AND RENOVATIONS

CLASSIFICATION OF EXPENDITURES BY OBJECT

- **PERSONNEL COMPENSATION**
- **TRAVEL**
- **CONTRACTURAL SERVICES**
- **SUPPLIES AND OTHER EXPENSES**
- **EQUIPMENT EXPENDITURES**

THE UNIVERSITY OF VIRGINIA FACILITIES MANAGEMENT

Office of Work Management

MAKE/BUY COST DIFFERENTIAL REPORT
3RD QUARTER
March 16, 1992

A. ANNUAL CONTRACTS

Type of Contract	In-House Proposal	Lowest Firm	Cost Differential
None completed during 3RD Qtr.			

3RD Qtr. Cost Differential:	$ N/A
Previous Quarter Differential:	$ N/A
Year-to-Date Differential:	$ N/A

B. FURNISH & INSTALL CONTRACTS

Type of Contract	In-House Bid	Lowest Bid	Cost Differential
1. Interior Painting			
WO #704201 Task 030	$ 1,160.00	$ 1,323.00	$ 163.00
WO #720716 Task #038	$ 3,016.00	$ 3,253.00	$ 237.00
WO #933195 Task #032	$ 500.00	$ 937.00	$ 437.00
WO #971645 Task #33	$ 420.00	$ 606.00	$ 186.00
2. On-Demand Constr. Services			
WO# 704107 Gilmer Hall Expansion Joint Repair	$ No Bid	$ 6,182.00	$ N/A
WO# 720761 Blue Ridge Hospital Daycare Upgrade	$ 35,806.00	$ 41,097.00	$ 5,291.00
WO# 704074 Hotel D Walk Improvements	$ 14,681.00	$ 24,680.00	$ 9,999.00

	In-House Bid	Lowest Bid	Cost Differential
WO# 703834 Randall Hall Replace Sidewalk	$ 10,881.00	$ 10,769.00	$ 112.00
WO# 704073 Thorton Hall Repair Sidewalk	$ 22,163.00	$ 25,011.00	$ 2,849.00
WO# 720817 MR-4 Office Renovation	$ Bid Rej.	$ 19,487.00	$ N/A

3. Casework

WO #933020 Task #002	$ 1,656.00	$ 1,825.00	$ 169.00
WO# 933021 Task #001	$ 1,844.00	$ 1,075.00	$ 769.00

3RD Qtr. Cost Differential:	$ 20,212.00
Previous Quarter Differential:	$ 71,334.00
Year-to Date Differential:	$154,892.00

C. SPOT PROCUREMENTS

Type of Procurement	In-House Bid	Lowest Bid	Cost Differential

None completed during 3RD Qtr.

3RD Qtr. Cost Differential:	$ .00
Previous Quarter Differential:	$ 2,840.00
Year-to-Date Differential:	$ 5,386.00

Total cost differential for all three areas above:

3RD Qtr. Cost Differential:	$ 20,212.00
Previous Quarter Differential:	$ 74,174.00
Year-to Date Differential:	$ 160,278.00

Note: Low bid figures from outside firms include applicable administrative surcharges.

D. CUMULATIVE INFORMATION

3RD Qtr. Total Cumulative Volume of Make/Buy Awards:	$ 91,246.00
3RD Qtr. Total % Awarded to In-house:	87%
Cumulative Volume of Make/Buy Awards Since Start of M/B Program:	$ 1,994,802.00
Total % Awarded to In-House Since Start of M/B Program:	75%
Cumulative Differential of Make/Buy	
Fiscal Year 1990-91:	$ 433,294.00
Fiscal Year 1991-92:	$ 160,278.00
Total:	$ 593,572.00

Downsizing Creatively: Doing More for Less

Patrick J. Lawlor
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Introduction

A 1991 **Business Week** survey of 1,000 leading corporations across the country indicated that nearly half have undertaken a downsizing effort in the past three years. Alarmingly, over 70 percent of those surveyed indicate that their efforts did not attain the results expected, most failing to a significant degree. This data, repeated over and over across 50 states, paints a picture of insufficiently planned, hastily devised, and clumsily implemented attempts at massive cost reduction, which all too often is found to be inadequate in scope and targeted to weaken, not strengthen the organization.

Our nation seems to be frozen into the most significant recession it has experienced in 50 years. Ongoing pressures from our own weakened economy and continued assault from strong overseas competition will be with us well into the next decade. This troubled economic condition will carry with it the need to implement periodic organizational adjustments as a way of life for American management.

Given that this trend for periodic downsizing will be part of our professional lives in the foreseeable future; that the cost of downsizing in terms of lost resources, human suffering, and damaged morale of the "survivors" is enormously high; and that its track record in our society is at least questionable, it seems only prudent for us to look at the whole downsizing issue with care and develop a skill at a successful process.

As facilities professionals, we are one of the most exposed groups caught up in the trend to downsize. We are responsible for a fairly expensive, largely labor-intensive activity (plenty of perceived opportunity) which operates outside of the main product/profit stream (plenty of perceived rationale). These are reasons enough to make facilities a prime target for the downsizing ax. It becomes overwhelming if you add to these the further perception that significant portions of facilities work can be left temporarily undone through deferred maintenance and the temptation to severely "streamline" facilities.

In the midst of the challenging reality surrounding us all, this presentation has three (3) goals:

1. To briefly review the typical downsizing strategies in use in American industry today, (which only works sometimes).

2. To guide the facilities professional in how to best conduct a downsizing in his or her operation - if one is called for.

3. To present a practical formula for avoiding downsizing altogether, or at least for softening its effects.

Downsizing Strategies

The literature calls them "Product/Service" and "Management Systems" approaches. They broadly represent the two basic methods used in organization downsizing in our economy today.

To generalize the first strategy, corporate senior management initiates a more or less rigorous analysis of the characteristics, profitability, and future of the organization's various products and services, the interdependence of these separate products, and the importance of each to the central mission of the organization. The final goal is to determine which products/services should remain and flourish and which can be curtailed, consolidated, or eliminated. Ideally from this analysis, specific plans flow for department reductions, job eliminations, and restructuring of operations.

The method is thoughtful and rational - to the extent it is based on analysis of final products, the reason d'etre of the organization. The reality nationwide has been that analysis and action are typically demanded in much shorter time spans than the product analysis process actually requires. Additionally, management has difficulty insuring objectivity in analysis response. The result of these difficulties has too often been that reduction decisions are faced under time duress, unsupported by crucial data and at lower levels, and made too far "up the line" to be sufficiently accurate. Missed opportunities or worse have been the result.

The second strategy, "Management Systems" approach is, by far, the more common method. In essence, senior management decides on the reduced funding levels required to bring the organization into competitive shape. This

overall target is allocated to existing work groups. Middle managers, supervisors, etc., then model their staff and expenses to match their reduction allocation, all this, without much real analysis to match reductions to operating needs at initiating levels. Its relative popularity is probably due to the fact that downsizing is commonly forced on organizations with little time for careful planning.

The method is swift and simple, but final decisions are made too far removed from the everyday realities of product importance and service delivery. The result can be inappropriate curtailment that misses the mark and may significantly hamper the organization's operations.

Regardless of the strategy used, the results nationwide indicate serious shortcomings in the downsizing process. The flaws stem from three (3) sources:

1. Downsizing details today are too often not developed by persons close enough to product delivery to objectively judge the actual needs of daily operation. Reduction decisions are made without the benefit of intimate product or operation knowledge.

2. Even when prepared close enough to the facts of daily operation, reduction planning is not begun far enough in advance to be effective. Reduction actions are initiated and supported only with incomplete data.

3. In too many instances, downsizing is not really rigorous or widespread enough to deal with the size of the competitive problem facing the typical organization. More and more corporations are reporting costly downsizing operations which must be repeated or reversed within a few months, due simply to inappropriate, optimistic prognosis of recovery sales, economic turn-around or misplaced humanism.

A Seven-Step Formula for Downsizing

With all this challenging data surfacing in the midst of recession-fueled reductions, what are you to do when faced with downsizing in your facilities organizations? For facilities professionals (and others) about to be involved in the downsizing experience, there is a management formula which, in practice, promises to maximize the chances for a successful outcome. Incidentally, under certain circumstances and if implemented effectively, a professionally planned downsize can produce a stronger, more effective facilities organization.

Step I. Personally identify opportunities for downsizing in every part of your facilities organization, in each aspect of its work, and at every level - using input from sources as close to product delivery as possible. "Identification of opportunities" will be more successful if adequate time is allowed for this step.

Step II. Decide on a level of cutback appropriate to each part of the operation. The depth of the cutback obviously will depend on the demands of

the marketplace and operations contribution required of the department involved. The distribution of cutbacks will depend on the judgment of you, the on-site manager; how to meet overall organization expectations of reduction, yet produce acceptable performance. Perhaps resource only for acceptable performance needs to be left in place.

Step III. Once downsizing is called for by senior management and specific actions and goals have been identified and distributed to relevant implementers, keep the organization clearly focussed on results and required schedule. Downsizing is a chaotic and unpleasant task and all too easy to rationalize away while addressing other more "normal", less confronting business demands.

Step IV. Schedules for downsizing should be set to be completed as quickly as possible. Dispatch is the key word. Move towards reduction actions promptly and decisively. Step 3 has to do with keeping the organization's focus on the difficult task at hand. Step 4 reflects the organization's need to complete the various tasks with all speed. Nothing is more damaging to the standing organization than delay of a publicized reduction in force.

Step V. From beginning 'til end of the process and at the appropriate time, communicate all authorized expectations and plans widely among employees, suppliers, and customers.

Step VI. Put as much effort into healing the remaining organization as you do into elimination of staffing and unneeded expense items.

Step VII. Establish a post-downsize audit of actual results and a subsequent control on newly reduced costs and employment levels.

Facilities Downsizing

We can apply this model to the task of downsizing in facilities.

Step I. - Identify opportunities for reduction - throughout the organization.

A. Examine whether each trade or support function or their staffing level is really needed to provide indispensable services to the parent organization or can part of the department be eliminated? There is a management theory that says every organization has 20 percent of its expenses in activities that can be reduced without affecting output.

B. Examine whether shift changes, etc. can achieve a continued (or enhanced) performance while realizing cost reduction.

C. Examine the full cost savings and (non-financial advantages/disadvantages) of contracting for services and trades versus maintaining an "in-house" service. In considering contracting for services, there are six (6) questions which need to be carefully addressed:

1. Does appropriate analysis indicate the opportunity for savings in going outside "the house" for trades support?

2. Are there local businesses of sufficient size in sufficient number available to provide for our needs?

3. Will the political realities of our organization accept contracting for services, consequently eliminating large blocks of positions?

4. Does your organization have sufficient professional strength to manage an environment where cost-conscious, responsive facilities contractors will be relied on for your success? Is there sufficient supervisory talent available to schedule and follow-up on contractor efforts and quality, thereby achieving actual savings?

5. Is it possible and advantageous to contract only part of your needs in a particular facilities trade or activity - rather than contract the entire activity? Partial contracting can be a way of achieving savings while holding a cadre available for flexibility emergencies dealing with contractor problems, etc. It is prudent to maintain a cadre of professionals inside for emergencies, etc.

6. Do you have a management audit process in place which will insure contract savings and contractor performance?

D. Analyze available facilities manning and expense levels in your organization as compared to related facilities organizations elsewhere. Are you clearly overstaffed as compared to our competitors? In almost every case, comparative data needs to be examined with a mixed attitude of open-mindedness and skepticism. You may have hard realities of your own performance to face; on the other hand, the data can be less than objectively presented.

E. Determine if you can afford to reduce your frequency of service (in painting, housekeeping, preventive maintenance, etc.) and still provide an acceptable service product.

F. Examine existing contracts (service contracts, trade contracts, design contracts, etc.) and determine in detail the real need, required frequencies, and reasonable level of expenditure of each significant contract. Renegotiate levels of service and costs.

G. Open all existing contracts for a general, across-the-board percentage reduction. In tough times, vendors who wish to remain with you should be prepared to reduce their prices. Insure such a reduction does not come with an unacceptable reduction in service.

H. Institute a "no nonsense" utilities cost reduction program. Such a program should focus on reduction in lighting levels and control temperature levels; include installation of energy savings devices; enhancement of central power control; and such other items which will yield

relatively quick savings. In this process, it is almost always valuable to reexamine the appropriateness of your utility bills, analyses, and payment process.

I. Examine the feasibility of reducing periodic preventive services (such as pest control) - what services can be reduced without raising an unacceptable level of customer complaints?

J. Examine possibilities of reducing costs of office services by reduction in numbers; consolidation; development of office support pools, etc.

K. Examine the possibility of consolidating separated trade groups spread out over a group of facilities into one shop facility to achieve better control; thereby, reducing force size without affecting service.

L. Consider a consolidating reorganization to allow for management (and staff) reductions.

M. Is your organization doing work you are not getting paid for? Can you stop doing so and recognize a savings or can arrangements be made to begin receiving payment for service?

N. Consider if there are services (telecommunications, trash, etc.) which can be delivered at a lower cost and the same quality by changing the process, product, or number of vendors involved.

O. Consider the use of total facilities management organizations which are available to undertake the entire facilities function. These organizations and their track records need to be examined with care. In certain instances, with proper controls, willingness to significantly reduce your own management and supervisory staffs, and adequate contractual preparation, they can be the source of significant savings.

Step II. - <u>Decide on level of cutback by department. Distribute it over the facilities organization in ways which do not disrupt service</u>.

In this process, objectivity and service needs, not equity, are the criterion. Organizations and departments (in facilities and elsewhere) typically grow fat over time and downsizing is the opportunity to remove unneeded size. Similarly, organizations and departments are sometimes kept in existence in spite of changed circumstances warranting their elimination.

The primary issues for allocating judgement always are:

A. How can this service be best delivered at minimum cost to actual waiting clients who need the service and are willing to pay the cost?

B. What is the smallest simplest structure for the support, communication, and supervision needed to insure service delivery?

Some groups, departments, and levels of supervision can and should be cut back and in doing so, with no plan for eventual reinstatement to previous strengths.

Steps III. & IV. - Keep focussed and move decisively.

Downsizing actions clearly run counter to our general management perceptions of status and the importance of size. Reduction in operational size can present at least a perceived career risk to the downsizing manager. Downsizing actions involving staff reduction invariably extracts a high cost in terms of personal human suffering and requires a considerable courage to perform. All of these realities pose a clear temptation to vacillate, delay, and moderate reduction plans. Any of us can find plenty of examples of delay in implementing management decisions to downsize in the organizations around us. Yet, delay in appropriately developed reduction plans does injustice to the persons directly affected, the organization's health and staff who will remain.

Step V. - Keep communicating.

In a single day in July of this year, I experienced first-hand the confusion, fear, and unrest set up in reducing a public organization which had been communicated possibly too fully and too early, and the anger and bitterness in a group of employees who had literally first heard in the local papers of the merger of their bank - and, the consequent loss of their jobs.

Once specific and detailed plans for an organization's curtailment have been developed and fully approved, there is absolutely no reason not to communicate the full facts to:

(1) the employees affected;
(2) the employees to remain;
(3) your customers;
(4) the general public (as appropriate);

swiftly and in that order.

If delays in the process are unavoidable or if if will be lengthy, then continued communication in the form of updates to all employees, supervisor/employee meetings, information to clients, etc. needs to be carried out. Whenever possible, the completion of downsizing also needs to be widely communicated, again to clients and most especially to employees remaining. Specific communications ("dos" and "don'ts) are discussed.

Step VI. - Heal the surviving organization.

One of the elements of the downsizing process most often forgotten is the reconstitution of morale in the remaining organization. Surviving groups are weakened by downsizing. Downsizing actions leave shock, uncertainty, and anger in the minds of the survivors. A responsibility we have to our organization and our fellow workers is the re-establishment of morale and service with

pride. If there ever is a time for extensive and enhanced communication, future plans, and vision for the organization - it is now.

The facilities organization after a downsize is a group in recuperation. New energy and thrust needs to be put in place. This can be done most effectively from within the facilities group itself and the senior manager generally must endorse and initiate these recuperative activities.

Step VII. - Undertake a post-downsize audit.

Another often overlooked step in the downsize process is post audit. Simply put, this step requires a periodic review of:

A. specific downsizing plan, item by item;

B. steps taken (when completed and to what degree);

C. savings actually achieved;

D. actual result on service provided;

E. proof that the resulting organization has been kept to the smaller size planned in the reduction process; and

F. perception of clients to the services being delivered.

Too often, rationalizations, accounting anomalies, procedural delays, and creeping expansion serve to diminish our planned results in a downsizing effort. We find also that service has been too severely taxed - or not taxed enough (indicating further cuts are possible).

Also, managers with a propensity to growth will energetically expand again as soon as the dust settles in downsizing. All these anomalies and others occur with special force when the senior manager is focussed on the downsizing issue - hence the need for post audit.

Avoiding Downsizing

There is a way of avoiding, or at least lessening, the cost of the typical downsizing project. That cost is taken out in terms of lost resources, human suffering, failure of expectations, and loss of morale inherent in our present reduction methods.

The key is to get and keep the organization size in tight control when rational planning time is available before the demand for downsize effort becomes necessary and the schedule for analysis and action becomes unrealistic.

The natural tendency in any organization is to grow, add expensive services, develop costly new systems, etc. In the fact of a continuing

constraint in our general economy, the wise manager is best served by insisting on:

A. a rigorous audit of the cost and performance of outstanding major contracts;

B. a critical review of the function of and need for all groups and departments in his/her area;

C. a control on hiring, perhaps a selective freeze on hiring until organization manning is below the average (by trade) of others in the same industry; and

D. publicizing size control efforts internally so that success in "preliminary downsizing" is registered with senior management to avert or lessen the effect of a traditional corporate-wide downsizing project.

PLANNING, DESIGN, AND CONSTRUCTION

The Classroom of the Future

C. William Day
Senior Partner
KBD Planning Group, Inc.

Within the education sector, it is no longer debatable that technology must be integrated into all educational-related operations.

When one thinks of the 21st century, there is a tendency to view it as being a long way off, with apprehension due to the uncertainty of what it will bring. However, our college freshmen of the year 2000 have already started their journey through our school systems. It is therefore essential for today's educators to gain insight into the future and assess the needs of tomorrow's adults.

High technology, megatrends, transformation, electronics revolution, genesplicing, computers, telecommunications, lasers, robotics, high tech--high touch, fiber optics and smart buildings -- these are the drumbeat of life on the frontier of the information age. What a time to be alive! What a time to be involved with career development; what an opportunity for education to help build a brighter and better world!

Tomorrow will bring an increasing impact from computers and technology calling for additional technological training. Because of the increasing change in the job market, lifetime learning will be necessary for adults needing ongoing skill building and re-tooling. Due to the continued improvement of medical technology, people will be enjoying a longer life span, producing a need for dealing with the health and physical fitness development of the individual.

Our environment as well as society in general will be in constant change presenting the necessity for additional coping skills with change and dealing with the unknown. Survival in our society will require increased emphasis on human relations skills with the advent of increased knowledge and improved technology. Higher level thinking skills with emphasis on problem solving will need to be developed to deal with the decisions to be faced.

The classrooms of the future will need to compete with the ever increasing influence of television on society, attempting to provide motivation to students in tomorrow's world of "show business." Classrooms and laboratories will need to be a place where students enjoy being busy, displaying a curriculum showing relevancy toward life. These programs of study need to be comprehensive enough to assist young people in working toward self actualization which in turn contributes to a worthwhile, satisfied, happy individual. There will be an increasing need for consideration for the "disaffected" student - the student turned off by institutionalized learning.

There will exist a need for increased partnership between business and education to work toward mutual goals for our community and society. At the same time state and federal mandates could continue to impact our educational institutions.

The future outlook can be negative or positive depending upon our own projections and attitudes. There is much recent evidence indicating an optimistic future. As we consider the various elements in the future, we must continue to emphasize that the future is built on improving what we already do best. This maintains some positive continuity and provides for additional improvements. As changes take place in the future, higher education will become increasingly the most stable institution and may be asked to do more from basic programs to older adult learning.

History has shown time and again that lack of foresight and planning has contributed to a failure to provide necessary programs for our students. The mission of educational leaders is to examine existing academic programs, and plan for programs that will be needed. As one thinks about and plans for the future, one must remain flexible enough to accommodate the unexpected, because no matter how future-oriented we may be, we can never completely anticipate all students' future needs.

There are some trends which are being recognized now, which will continue and gain strength for the next several years. The classroom of the future is an environment of access; a learning environment designed to provide professors with direct access to the multi-formulated body of knowledge they are expected to teach.

As the body of knowledge has increased geometrically in recent decades, the techniques of access have increased arithmetically; creating a widening gap between available knowledge and applied knowledge. Part of this problem comes from the limited communication technology available to college professors.

With the influx of technology and new knowledge, the college student of the future will need improved problem solving skills and higher level thinking skills in order to take in information, analyze it appropriately and react to it. Also, because of the increasing use of the computer all students will need adequate computer literacy and basic usage skills. Students coming out of college will need basic technology skills that are transferable from occupation to occupation in a changing work environment. He/she will also need those basic skills necessary for transition from the college environment to the world of work or to post graduate training.

The increased life span of future citizens and increased leisure time, will require skills in lifetime physical activities for good health, recreation and enjoyment purposes. The constant change in our work environment will require a love for learning that will be ongoing throughout a lifetime. The increased mobility of society will require citizens to have improved people skills and a breadth of understanding of other cultures. In addition, the ever increasing complexity of economic involvement of all countries will require basic understanding of international economics as well as understanding of our own economic system. Therefore, education must become more like business. If you want a business to be #1 you must have the best people and pay them. If you want the best business then you must have the most up-to-date equipment and facilities. So is the case with education.

Future Needs

All facility designs should provide maximum "user/owner options" - i.e., the flexibility to allow for:

- Immediate internal functional flexibility
- Variable sizes of space
- Re-shapeability for easy, future, long range modifications
- Logical and simple expansion potential

Designs for facilities today also show increasing sensitivity to the the special demand of electronic instruction, varied staffing patterns, energy concerns, handicapped access and cost effectiveness.

Planning for housing future education in new facilities demands a scrupulous and creative look at the future of society and education. Educational housing trends for the future depend a great deal upon the openness and farsightedness of educators, planners and architects. Will past practices determine our decisions concerning programs and facilities, or will fresh, responsive, future-oriented attitudes prevail? Here are just a few possible new directions for post-secondary facilities:

- For instructional areas of the future, let us for a moment, try to visualize the physical setting. Look at the world around us, how services are delivered in the commercial world, what attracts the clients. The best example is the shopping *mall complex*. We will need more high-tech areas that can be shared or integrated by multiple colleges or schools within the campus.

- *Computer Labs* will not exist in substantial numbers because computers will be integrated into subject matter learning.

- "*Commons*" or "*People Places*" will be needed to reinforce a sense of freedom. Like hotel lobbies and shopping mall oases, commons areas within classroom and laboratory buildings encourage respites, socializing and gathering, usually in a setting that incorporates greenery and natural design.

- A trend toward smaller nodes of "found" spaces within classroom buildings, housing complexes, and library areas for hands on work experience with multimedia equipment.

- Students will need the ability to access data bases and other information from their dormitory any time during a 24 hour day.

Design Criteria

Educators and educational technology consultants should design the system to suit the needs of students and professors. The classroom of the future cannot be accomplished simply by installing products by vendors with something to sell. The final solution should include a fiber optic-based signal distribution system, open-architecture building design and cost-effective operation.

In planning and designing a state-of-the-art integrated information system (IIS) system, the following criteria should be used.

- Allow the faculty total control of media output;
- Every instructional space should have a 27" television monitor, telephone & data jacks;
- Design the system to meet not only today's requirements but at least the next 15 years by using a combination of fiber optic and copper cable for the infrastructure wiring;
- Keep the architecture open to allow for growth and change;
- Make it easy to learn with standardized controls;
- Make telephone access for long distance available, and
- Let faculty request the information and services--the what, where and when--but let the computer determine the technical method of how.

Benefits

With IIS, faculty can pursue traditional teaching through an integrated information system in an option-laden environment that offers access to an array of instructional materials. The result is higher efficiency for faculty and greater motivation for students.

IIS can bring information (graphics, illustrations, data, films, tapes and more) to all instructional areas from a central disbursing point located anywhere on campus. Faculty have access to virtually all formats of instructional media which are then displayed through the IIS system.

From a classroom touch panel or a remote control, faculty can control optical laserdisc, VHS and S-VHS tapes, CDI, CDTV, video floppies, 16mm films, downlinks via satellite, commercial and public television, and other media. Sources can be mixed and used simultaneously. Only information is moved; faculty need not trouble themselves with VCR's or film projectors. Each instructional area will have a phone/data jack to enable local interfacing with a distance-learning source. System control is handled via phone lines.

One additional advantage of the IIS, perhaps underestimated, will be the financial savings realized. Without A/V carts being pushed around buildings, across campus, and sometimes tipped over, substantially decreased maintenance, repair and replacement costs will be experienced. Additional savings will come from fewer personnel being needed to operate the "audio visual" department, plus reduced insurance costs. At the same time faculty will have better access to equipment, and media department managers will have full control because nothing leaves the site.

Faculty need not master any technical skill other than pushing a few buttons on a standardized panel. And a phone link from the classroom to the main control area relays any difficulties to technical people who are available to solve such problems.

Quality Instruction

Quality instructional media that excites students can be created by faculty in cooperation with a production manager or by student graphic artists. If one accepts the findings of the Hudson Institute study --that 60 percent of what students know derives from television -- then similar alliances will have to be forged as faculty and technicians fashion a curriculum tailored for students in the 1990's and beyond.

IIS differs from systems that simply relay commercially produced teaching materials because it encourages creative curriculum development. Instructional media are not simply appended into traditional teaching, but instead can be custom designed and integrated with the professor's normal teaching techniques.

The Final Look

A centralized distribution room can serve as the hub of the entire integrated voice/video/data system. It will house the controlling equipment, video and voice switches, fiber-optic distribution point, system controller, source machine controller and all of the input devices. It is connected to each classroom and/or laboratory through a riser system of fiber-optic and/or copper cable.

Each classroom will have a locking wall box that contains a telephone; voice, data, and video connectors; an easy-to-read control panel that gives faculty push-button access to all types of audio-visual equipment. Identical functions are also available from an infrared remote control or computer keypad. Faculty need learn only one controller, which can be used in any classroom on campus. Further, the controller is smart -- it will not allow commands that don't apply to the medium selected.

With the capabilities of satellite reception, cable TV, laserdisc video, compact disc video, interactive computer video, and desktop video production bringing video into the classroom is easy. Cable TV can bring to all classrooms the ability to receive programming from all major networks. IIS is "concrete proof that holistic planning and integrated technologies can and will lead to improvements for faculty and students in the learning environment.

Conclusions

While we have known for a long time that different students learn differently, on the whole, they are not being taught differently. We must use the technological tools available to relieve the professor of those learning tasks that largely require repetition and feedback. Faculty must adapt to new roles. Technology tools helps relieve professors of the burden of being the primary source of information to students; instead faculty can be learning coaches. Teaching by video requires different skills--more dynamic presentation methods and different approaches to managing students--that some faculty will find difficult.

The inclusion of video and interactive medias via fiber optic delivery or in other forms enhances instruction and administration. As systems emerge with the power to deliver huge amounts of content to classrooms and instructional spaces educators will need to take a hard look at the materials that have traditionally been used to augment instruction. The capabilities of these new information systems demand that new forms of content be developed to maximize the abilities of our students.

Initial results sustain the assertion that the Integrated Information System, in our classrooms, might very well be "the best educational tool around." Its flexibility and affordability may transform teaching, from kindergarten to graduate school, in this very decade. That transformation could result in higher quality and more affordable public education.

Master Planning Techniques for Success

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Introduction

For many years, campus planners have used a "typical" process for creating campus master plans. This process has produced successful—and not so successful—plans. What's the difference? And what can colleges and universities do to help ensure the preparation of a successful campus master plan?

The campus master planning process, a systematic approach to problem-solving, identifies the development that should occur on campus, based on the needs and goals of the university. The final plan, which contains development costs, provides a stable framework to help university administrators plan capital budgets and fund-raising activities. A successful master plan:

1. Is created using consensus-based decision-making by campus and community leaders;
2. Represents the needs of the entire campus community;
3. Is implemented;
4. Is still being used to direct the development of a campus five to 10 years later;
5. Works for academicians as well as facilities and operations managers;
6. Is reviewed on a regular basis; and
7. Is flexible when changes and updates become necessary.

Woolpert, a multidisciplinary professional services firm based in Dayton, Ohio, has prepared campus master plans since the mid-1970s. Our campus planning team is made up of physical planners, landscape architects, and architects. With such a diverse team, we can bring a variety of perspectives to

each project. Over the years, this team has developed and refined eight techniques for successful campus master planning. This paper discusses how our team uses these techniques to formulate a master plan that is responsive to a university's needs and goals, is completed in an interactive process that promotes a sense of commitment and ownership, and results in a report that is useful and able to be implemented and understood by the university community.

Campus Master Planning Today

The campus master plan is finally coming of age. Many states are requiring public colleges and universities to prepare campus master plans before seeking capital improvement dollars; private colleges and universities are following suit. The competitive nature of higher education demands that campuses have an attractive, well-organized appearance. While academic quality is certainly a critical factor for students and parents choosing an institution, an equally important factor may be the "look and feel" of the school being considered. A university that makes a poor first impression isn't likely to draw a potential student back. Conversely, a pleasant, well-organized campus—usually the result of a thoughtful master plan put to use—makes a good first impression and gives parents confidence in the school. In the long run, such universities attract and retain the most students.

Sound campus master planning is also needed because enrollment is down, money is tight, and institutions are being told to "do more with less." Today, there are more schools and fewer students; that means fewer available resources. In the meantime, higher education costs have continued to climb. Besides being an important tool for helping universities, community colleges, and technical schools spend their capital improvement and operations dollars wisely, campus master plans are needed to plan for growth. For example, community colleges having parallel or consortium programs with four-year universities are increasingly becoming a cost-effective choice for many students who would once have attended four-year schools exclusively. Now bursting at the seams, community colleges are finding that a sound master plan is an absolute necessity to plan for future growth.

In spite of the benefits that sound master planning offers, some schools view plan development as merely a means to an end. Instead of basing the physical development of the campus on thoughtful goals and objectives, actions outlined in some mandated plans are reactionary and project-specific, such as "we need a new engineering building adjacent the chemistry building," or "we need to create three new parking lots on west campus." The problem with reactionary or project-specific planning is that groups within the university may spend hundreds of thousands— even millions—of dollars pursuing conflicting goals. Implementing an "obvious" solution immediately, without following a plan, is risky; what may seem like an obvious solution to a vice president may prove to be inappropriate for the university at large.

For example, Woolpert worked with a university that wanted to expand its research and development (R&D) facilities. This university had acquired and planned to use vacant land on the opposite end of campus, far away from the engineering and science academic buildings. Because of the important physical relationship between engineering/science and R&D, we suggested the possibility of acquiring vacant land adjacent the academic buildings—but owned by a state hospital—for the R&D facility. Land on the opposite end of campus could then be opened up for university-related economic development. This solution, while not the most obvious, proved to be the most viable, and a new academic/research building has been completed. Another benefit of this solution has been improved, ongoing relationships between the university and the state hospital.

Schools with a vision see plan development as an exciting opportunity to begin a process involving the university community, the surrounding community, and campus planners. As facilitators

of plan development, campus planners help university and community representatives see the university in its entirety instead of in the context of individual interest groups. In an interactive planning process, campus planners—together with university and community representatives—are challenged to identify and evaluate the broad-based needs of the university, assign priorities, and provide a balance to plan recommendations.

The "Typical" Master Planning Process

The typical master planning process consists of the following work phases:

1. Inventory and analysis. Campus planners gather knowledge about existing physical conditions by analyzing information and touring and observing the campus.

2. Design framework. Through a series of meetings and interviews, campus planners and university representatives identify issues and opportunities, goals and objectives, program elements, and design criteria.

3. Alternative concepts. Campus planners prepare alternative schematic concepts to test ideas and evaluate relationships. These concepts are reviewed, and the preferred elements are incorporated into the recommended plan.

4. Recommended master plan. Campus planners prepare a long-term summary plan representing a combination of items selected from the alternative concepts. After being reviewed and refined, the long-term plan is used to assign priorities to projects and develop the short-term plan.

5. Capital improvement program (CIP). A CIP is developed to assist with master plan implementation. The program includes a detailed list of projects, implementation strategies, construction cost estimates, implementation time frames, and sequencing guidelines.

6. Final report. All key information and relevant plans produced during the planning process are consolidated in a final report, which documents the process, identifies significant conclusions, and becomes the tool for plan implementation.

Using a typical process, however, will not guarantee a successful plan. Woolpert has found that to ensure a plan will be accepted and used as the authoritative source for guiding the development of a university, we must concentrate our efforts on building relationships throughout the master planning process—between us and the university community; among university administrators, faculty, staff, and students; and among us, the university, and the surrounding community. To promote ownership in the plan on the part of the university community, the plan must reflect an understanding and a vision of the university and its broad-based needs; it must represent and provide for the interests of the campus as a whole, not the interests of individual groups. Moreover, the plan must be responsive to current campus conditions as well as the university's future needs and goals.

Eight Techniques for Successful Master Planning

Successful master planning for Woolpert is a participative, interactive process that requires input from the campus and surrounding community. We have used eight techniques to ensure that a campus master plan represents the needs of the entire campus community, is implemented and then reviewed regularly, and is flexible enough to handle changes and updates.

1. Getting the Commitment of the Administration. Typically, commitment of the administrator is either hot or cold. Administrators are either committed to the master planning process or they are totally indifferent. If they are not committed, it is Woolpert's job to earn this commitment, starting at the project interview, by demonstrating our knowledge and expertise in the planning process. Once the project has been awarded, we meet with a key administrator as soon as possible, usually the university president or vice president, to listen, learn the administration's responsibilities and organizational structure, and receive direction on the project. Also important are reading, understanding, and asking questions about the university's mission statement.

It is our goal to instill a commitment in any uncommitted administrators during the first few months of the project. We know that when administrators commit to plan development first, support for the project usually "trickles down" to the master plan committee, which is a broad-based group of campus and community leaders tasked to work with campus planners during plan development. (If we are unsuccessful in gaining the administrators' commitment, the master plan committee may convey an enthusiasm that successfully "trickles up" to the administration, resulting in their commitment to the project.)

The level of commitment from university administrators varies. One university president joined Woolpert planners on a five-hour Sunday afternoon walking tour of campus. We also met informally with the university president, senior vice president, and facilities director for two or three hours on several evenings during the year-long project to talk, share ideas, and review the plan. However, at another university, we were forced to gain the president's commitment by working through a vice president. In this case, the president had bowed out of the planning process early, claiming that interviews with him were unnecessary since he had appointed a master plan committee to handle the task. Because an involved president is critical to a successful plan, we appealed to the vice president for administration, who agreed to give the president regular updates, ask for his ideas, and report back to the master plan committee. Both strategies were successful.

As more states and boards of trustees mandate plan development, it may be more difficult for campus planners to get commitment from administrations who are developing a plan merely to fulfill a requirement. One university official (who did not want a master plan but was required to prepare one) quietly told Woolpert planners at an initial get-acquainted meeting to "find an old report, change a few words, and send a bill." In this case, besides being challenged to get the administration's commitment to the project, we also had to convince administrators of the program's inherent value. One year later, the university president invited Woolpert planners to a two-day retreat to present and discuss plan details to university administrators. According to the president, the final plan was "practical, creative, but most of all an intelligent document that made sense." Today, the plan is being implemented and is used regularly. (In fact, the university official responsible for facilities and the campus carries his tattered, note-riddled copy with him constantly.) For us to secure this kind of commitment, relationship-building most certainly came into play.

2. Choosing the Master Plan Committee and Defining Its Role in the Process. Another critical technique is forming a broad-based master plan committee of faculty, staff, students, and community leaders with authority to make decisions representing the needs of the university as a whole. When the process begins, master plan committee members typically bring to the table information and concerns relative to their own disciplines or departments. We have found they soon learn to look at the big picture and accept compromises—even when a decision unfavorable to an individual cause is deemed better for the university as a whole.

A master plan committee size of 12 to 16 members is not unwieldy, makes meetings relatively easy to schedule, and usually results in an across-the-board representation of campus and community leaders. Master plan committee members have three major roles: to consider the needs of the entire campus instead of individual agendas; to participate by sharing ideas and expectations; and to build consensus among themselves and their colleagues and peers. As the process continues, master plan committee members should be prepared to take a stand on various issues. When the group cannot reach a consensus, the vice president for administration or some other leader of the planning process is charged with the final say.

Master plan committee members commit to attending approximately eight meetings, each lasting two or three hours, during the year-long planning process. (While most plans could be prepared in four to six months, there would be little time for relationship-building or reflection on decisions.) Master plan committee meetings should be scheduled at convenient times during the school day, and never during exam weeks or popular athletic events.

We try to structure our meetings so that participants look forward to coming; they should see the sessions as a stimulating time for discussing ideas. At the end of each session, members should have covered a detailed agenda (prepared by us) and should understand what they must review and be prepared to discuss at the next meeting. Woolpert campus planners leave the meeting ready to prepare and distribute to members a summary of the ideas and positions discussed. As representatives of the campus and the community, members of the master plan committee should also be responsible for communicating the committee's message to their peer groups and helping build consensus (during faculty forums, student government meetings, and informal conversations).

Because master plan committee members are empowered to make difficult decisions during plan development, they should be chosen carefully. Typically, the vice president for administration convenes the 12- to 16-member master plan committee, which consists of campus and community representatives. Campus representatives would include academic deans, the dean of student affairs, a faculty representative, university staff, the library director, the physical plant director, the facility planning and management director, the student government president or other students, a member of the board of trustees, the chief of security, and other administrators. Community representatives would include neighbors, business owners, the city planning director, a city traffic engineer, a local utility company vice president, and others.

Woolpert also finds it important to invite campus or community representatives with strong opinions about plan development—supporters, pioneers, non-believers, and activists. By being included on the master plan committee, they have ownership in the plan and the decisions made throughout the process.

University administrators should recognize the uniqueness of the master plan committee. For perhaps the first time, a broadly representative group that cuts across all sectors of the university and the surrounding community will gather and work together, empowered to make a series of difficult decisions needed to accomplish a single goal. We notice that as we listen to the master plan committee, the committee members typically begin listening to each other, and relationships start building.

When relationships are *not* built, however, the planning process is placed in jeopardy. In one particular instance, a university, needing additional facilities and land to support its athletic and recreational programs, used its power of eminent domain to acquire the land. Residents and business

owners in the acquired neighborhoods were not involved in the planning process and were unhappy when the plans were announced.

Years later, the university hired Woolpert to formulate a campus master plan to meet state requirements and guide growth over the next 10 to 15 years. This time, the planning process involved open meetings with city officials, planning and development staff, and business owners, who were interviewed and participated on the campus master plan committee. The final plan, which was adopted, involved acquisition of additional land to provide for future growth and was supported by adjacent community officials, residents, and businesses even when it was their property that would eventually be redeveloped into the campus. Our approach ensured that consensus was built about where future development would and would not occur, and the information and timing for plan implementation provided adjacent neighbors sufficient notice to plan for the future. In this case, the participation of the surrounding community in the process took the mystery out of the university's plans.

Just as important is the support of the university community. At another university we worked with, the president (who did not believe in a group process for master planning) needed a fast-track campus master plan to present to the board of trustees. Woolpert planners were instructed to work with only an exclusive group of three top administrators. Predictably, when the plan was presented to the vice presidents and deans to "obtain their concurrence" before being delivered to the board of trustees, it was not well received; the vice presidents and deans—not to mention the rest of the university community—had not participated in plan preparation.

How the university and surrounding community perceive the master plan committee is also important. A respected master plan committee validates the planning process. A committee that has a diversity of representatives from the university and the community promotes a sense of confidence that everyone's needs will be reflected in the plan and makes the committee more credible.

3. Understanding Existing Conditions and Identifying Issues on the Campus and in the Surrounding Community. To build consensus with the university and surrounding community, campus planners must spend a significant amount of time doing extensive site inventory and analysis, making observations, and studying physical issues. (The amount of time often adds up to two to three months during a year-long plan.) During this process, planners learn about the university—its academic programs, facilities, and mission. For a well-rounded perspective, Woolpert makes plans to see the university in most phases of operation, from opening day in the fall to "downtime" in the summer. A thorough understanding of both the physical conditions and the issues forms the basis of the master plan.

Woolpert campus planners use various ways to collect this information, such as:

a. Tours/site visits. Touring the campus several times—accompanied by "tour guides" such as faculty members, the physical plant administrator, and various directors or deans—is the best way for us to understand daily campus operations, take inventory, and begin analysis. We find that both daytime and nighttime tours are valuable. During the tours, university representatives have the opportunity to share with us the nuts-and-bolts details of circulation and parking, existing land and building use patterns, and open space use. Building walk-throughs may sometimes be conducted to gather information about the physical condition and interior use of university buildings.

During site visits, Woolpert planners often share what works and what doesn't at other college campuses, based on our experience working on other master plans. Throughout this information-

gathering process, we try to be highly visible—in the cafeteria, in classrooms, in the bookstore, in residence halls, and elsewhere on campus. We have found that the campus community is usually more willing to accept and work with campus planners who are perceived as experts on the institution.

Our effort to learn as much as we can about the university and its issues is most intense in the beginning of the master planning project; our campus visits may at first be four or five days long. However, these early efforts are the most critical, since the relationships being built and our knowledge of the campus lay the foundation for a comfortable, confident working relationship when the toughest issues are later discussed, planned, and programmed.

b. Document review and analysis. Gathering and reviewing maps, reports, and other documents are yet other ways we learn about university history, past planning efforts, natural features, and the built environment. We review documents such as catalogs, bulletins, mission statements, strategic plans, neighborhood and traffic plans, safety plans, shipping and delivery operations manuals, and plans for new buildings or changes to building uses.

c. Interviews. We may interview as many as 40 to 60 people, including master plan committee members, students, city officials, and university officials such as the parking manager, bookstore manager, controller, residence hall director, campus security director, and athletic director. During the interviews, we challenge administrators, faculty, staff, and students to assess the strengths and weaknesses of current programs, evaluate existing conditions, and offer their ideas and perspectives about the future. (Common questions we ask include what will be needed to serve expected new programs, and what is anticipated to change in the next five to 20 years.)

Besides allowing university and community representatives to become confident with us and the plan itself, interviews let us collect and incorporate vital information into the plan. Information collected during interviews is usually more specific and goes beyond what is collected during site visits and tours. During an interview, for example, the plant operations manager may discuss central receiving, daily deliveries, delivery trucks, loading docks, and delivery truck travel on campus; the safety director may discuss the roles of campus police, areas of concern, and parking requirements.

Interviewing is time-consuming; it takes a while for university and community representatives to feel comfortable and confident enough to share their thoughts with us. But during this process, we have found the real issues at the university always come to light: a bad situation in a neighborhood, the need for a new facility, an administrator who won't confront a serious problem, university administrators not working well with municipal government. By giving university and community representatives—perhaps for the first time—a confidential forum to present their thoughts, the issues will reveal themselves. When given the opportunity, most people welcome the chance to share concerns.

d. Campus comment sessions and public forums. Since it's impossible to interview everyone associated with the university, campus comment sessions provide a forum for students, faculty, and staff to share their ideas and opinions with us. Public forums, usually scheduled in the evenings on campus, give members of the community an opportunity to voice their opinions on issues, and later, on proposed recommendations.

4. Building Consensus and Promoting Good Public Relations. Consensus-building is a gradual, open process; consensus cannot be built at the end of the planning process, when the final plan is presented. Consensus-building starts with getting a commitment from the administration and

continues until the end of the project. By building consensus through interviews, tours, master plan committee meetings, campus comment sessions, and public meetings, we have found that campus and community representatives become more confident in our abilities as campus planners.

Woolpert avoids using master plan committee meetings as a forum for making formal presentations. (Consensus is better built by tossing out "trial balloons" for the group's consideration and gauging response.) This technique gives the master plan committee time to reflect in a non-threatening environment instead of reacting immediately to an idea.

For example, we worked with one university that had in its mission statement the goal of developing a more pedestrian-oriented campus. The objectives included removing internal streets and adding more open space and landscaping to improve the appearance of the campus. Early in the planning process, we discussed using strategically located parking garages to meet demand on less land and converting surface lots to open space.

To illustrate the impact of parking on the campus landscape, Woolpert prepared three concepts to show alternatives using all surface parking versus parking structures. While the president was initially opposed to parking structures, as the process evolved, he and other key officials gradually saw the connection between objectives in the mission statement and the use of garages to "create" more land. The officials clearly saw how they could achieve their mission using a parking garage. The university's plan now includes three garages, which are also expected to meet other needs; a first-floor bookstore is planned for one, and central receiving is planned for another.

Part of building consensus requires that campus planners make themselves accessible and readily available throughout the planning process. While on campus, we request a room with tables and a telephone so that we can hold open office hours, which gives faculty, staff, and students an opportunity to drop in and learn more about the developing plan. Office hours should be posted and publicized on campus. Our goal with open office hours is to enlarge our network and become even more visible by meeting and talking with additional members of the campus community. By frequently leaving business cards with interested people, we encourage follow-up calls. As a result of this approach, we have received letters and telephone calls from faculty, staff, and students who shared their ideas with us during the process.

Besides being opportunities to gather information, campus comment sessions and public forums are another way that we are accessible to the university community. The goal for these meetings is mostly to help build consensus and promote good public relations. Before a campus comment session or public forum is scheduled, we post summary documents and land use maps showing proposed ideas in a prominent place on campus (usually the student union) so students, faculty, and staff can review the material.

Developing relationships with the student newspaper and the community newspaper is another public relations technique. Part of our technique involves working closely with the university public relations department to "connect" further with faculty, staff, and students; regularly preparing news releases and updates on the planning process; and being available for interviews. If relationships are developed, campus comment sessions and public meetings are more likely to be publicized and editors may be more interested in running stories on the project in university and community newspapers.

5. Presenting the Preliminary Recommended Plan. After compiling all the information collected since the project start and preparing and evaluating alternative schematic concepts, we have another opportunity for consensus-building when we present the preliminary recommended plan.

At this point, the preliminary recommended plan is still flexible and can be revised based on comments gathered during additional campus comment sessions, public forums, and meetings of the faculty senate, board of trustees, and other university groups. At meetings where the preliminary recommended plan is presented and reviewed, we make sure that the master plan committee chair, the vice president for administration, or a university representative is available to answer questions, demonstrate the committee's support of the plan, hear feedback, and take ideas and comments back to the master plan committee for further discussion, evaluation, and possible incorporation into the final plan.

During this process, it's important to explain, but it's even more important to listen to people from the campus and surrounding community. They need to feel confident that their ideas will be taken seriously by the master plan committee. After the committee has carefully considered all feedback to the preliminary recommended plan, the final plan can be prepared.

6. Defining the CIP (Setting Priorities and Preparing Cost Estimates). The next step is defining the CIP, based on the goals and objectives agreed on by the master plan committee. The input gathered during the participative process is the basis for identifying priorities and evaluating funding potential for the projects in the CIP.

A complex and essential part of this step is sequencing—considering what interim work is required before each improvement project is begun. What must be done right away to get a site ready for a new building? Will roads have to be changed? What about parking? If a parking garage is needed, where will cars be parked in the meantime? Will utilities have to be reworked? What about construction access roads?

To set the proper path to implementation, we have to establish priorities and prepare cost estimates for each project. In our experience, priorities are best established according to short-, medium-, and long-range time frames, instead of in numbered order. Projects that are ranked by priority according to time frame give administrators a shopping list they will need when doing budgeting and fund-raising.

7. Building Flexibility into the Plan to Handle Changes and Updates. Colleges are dynamic; therefore, a campus master plan must be considered a guidebook and not a construction document. Administrators never know when budgets will be cut or a major donor will come along. A seemingly minor budget cut could have a rippling effect across campus; as a result, the plan document should be dynamic and flexible to handle the changes and updates that will undoubtedly occur.

Changes on campus must always be considered in the context of the goals and objectives that form the foundation of the master plan. For example, Woolpert prepared a campus master plan that called for future construction of a central receiving facility/multipurpose warehouse to more efficiently handle deliveries of books and food perishables. A site that met the criteria for such a facility was not available when the plan was completed. Two years later, however, the city closed a children's psychiatric center adjacent the university, and suddenly a site was available that would not only satisfy some of the university's receiving functions, but also offered meeting rooms and warehouse space. Because Woolpert planners were included in the university's ongoing planning process, we could

quickly determine whether the site would work and what the implications of the new facility would be for the remainder of campus.

We have also found that priorities outlined in a plan may sometimes have to be reevaluated as new situations occur. For example, we recently completed a campus plan stating that a new humanities building would be needed within six to eight years; the plan suggested sites and included a budget. When a local philanthropist, who was active on the board of trustees and in various fund-raising efforts, reviewed the document and saw plans for the new humanities building, he expressed an interest in that particular project. His interest enabled the university administration to propose a donation that was approved. Suddenly, a priority six or eight years down the road was moved near the top of the list. Woolpert and the university had to be ready to shift gears and begin the detailed planning required for the design and siting of the new building, scheduled for completion in 1993. (After the process got under way, landscape architects and architects were sent back to the drawing board a second time after the local philanthropist suggested a different design concept; as a result, we had to work not only within site constraints and the design framework, but also involve the donor in the planning and design process.)

8. Using the Plan Effectively (Project Review and the Administration's Responsibility for Implementation). Once the planning process is over, the administration is responsible for facilitating the implementation. Woolpert recommends the following steps to the administration to ensure plan implementation:

First, the administration should demonstrate its commitment by formally adopting the plan. The faculty and student senates should also pass resolutions formally adopting the plan.

Second, the administration should keep the master plan committee working, active, and part of the university's ongoing planning process. This group should be the "guardians" of the plan, focus on priority projects to be budgeted, review projects for compliance with the plan, modify the plan to fit changing conditions, and work with campus planners on specific improvement projects.

At universities where campus facility committees are established, one or two representatives from this group should attend regularly. Discussions about the plan should become an agenda item during each meeting. One university committed to implementing its new master plan established a task force that included representatives from the master plan committee, an adjacent hospital, and the city. This task force meets three times a year to review priorities, current projects, and future projects that affect the participants. For example, the university and the hospital coordinated efforts to build a new interchange on a nearby highway. By working together, the university and the hospital designed, approved, funded, and constructed the interchange in record time, years earlier than envisioned in the plans.

A planning group or task force should also review, approve, and track improvement projects to make sure they are consistent and do not contradict the plan. If a diverse group at the university has the authority and the budget to spend money on physical improvements, there must be a close watch so that those improvements follow the plan. Decision-makers at the university should be aware of the plan and understand that design guidelines need to be followed; decision-makers who have been a part of the planning process are more likely to respect and follow the guidelines.

Third, the administration should consider asking campus planners to work with the planning group or task force, physical plant staff, and others to help implement the plan. Future decisions and

projects will remain most consistent and true to the plan if the campus planners stay involved after the plan is complete. Campus planners who are part of the university's ongoing planning process can respond quickly to unexpected needs. For example, after two rapes occurred on a campus where Woolpert had prepared a master plan, we were immediately called to campus to evaluate whether any physical changes such as lighting, fencing, or landscape removals were necessary to increase safety on campus. Having Woolpert on board let the university respond immediately to a serious situation.

Daily decisions/operations questions should be resolvable according to design guidelines in the plan. For example, administrators should no longer need to decide what type of light fixture to purchase for a building, or debate about whether to remove a tree, a marker, or a bench. If such issues have been addressed in the plan, they will not have to be considered time and time again.

Fourth, besides keeping the plan handy and referring to it frequently, administrators should conduct an annual, in-depth review of the plan, usually during the capital budgeting process, to determine what changes should be made based on changes at the university. The plan should be updated periodically, usually every five years. The frequency of each review and update depends on the dynamics of the university and how frequently changes occur. Any plan, no matter how good, that is in place too long without a review runs the risk of being abandoned.

Conclusion

Following a typical campus master planning process is important—but that won't guarantee a successful plan. Rather, sound master planning techniques—based on relationship-building, consensus-building, and the ability of campus and community representatives to participate meaningfully in the decision-making process—lead to a successful master planning process, which promotes ownership in the plan by the university. This ownership is key to implementation of the plan's recommendations, which should represent the needs of the entire campus community.

Campus master planning is time for a university to dream, envision, and challenge itself. By taking a thoughtful approach to campus planning, colleges and universities should improve the appearance and function of their campuses and attract more students in an increasingly competitive market.

Construction Management: The Owner's Perspective Revisited

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Defining Construction Management

Construction Management, or CM, as a concept is very simple as evidenced by the following definition offered by the Turner Corporation, one of the nation's largest Construction Managers:

"Construction Management is a technique which treats the planning, design, and construction phases of building as integrated tasks, as opposed to separate and linear functions. These integrated tasks are assigned to a construction team comprised of the Owner, CM, and the Architect. Ideally, members of the construction team work together from the inception of the project until completion, with the common objective of best serving the owner's interest."

Two key elements of the CM concept are evident in this simple definition. First, it is an integrated rather than a sequential approach. This means, for example, that design does not have to be complete before construction starts. This is an obvious time saver, and for this reason, Construction Management is often referred to as "fast-track" construction. This is indeed one of the major benefits of CM, but CM is not the only "fast-track" method and not all CM jobs are fast-tracked.

The second key point in the definition is the team approach and common objective. These statements highlight the other major difference about Construction Management: CM calls for a group of construction professionals selected for its technical capability, rather than one selected strictly on the basis of cost. This approach creates an atmosphere of mutual support to meet mutual goals, not the adversarial role that often arises in standard design and bid work.

There is a wide range of services offered by CMs including: constructability reviews, value engineering, cost estimating, scheduling, and inspection. The owner may pick and choose services based on the specific requirements of the job. This flexibility of service is important for owners to remember so that they are not talked into buying more than they need under the guise of "full-service" CM. Some people use modifiers such as "pure" CM or CM/GC to describe different contractual or service arrangements. The important thing to remember is that there is no strict definition of what constitutes CM. CM is simply an integrated team approach for meeting the owner's goals of acquiring quality facilities in a timely and cost effective manner.

Assets and Liabilities of Construction Management

There are four primary reasons for considering Construction Management on a particular project: (1) to more intensively manage the schedule of design and construction, (2) to more intensively manage the project budget, (3) to deal with technically complex construction, and (4) to supplement the owner's project management capability.

The most common reason for using CM is to manage the schedule. We at Penn State consider Construction Management on projects that must be completed on a specific date that cannot be achieved through the traditional design-bid-build approach. The CM can control the schedule through fast-track methods and by coordinating the activities of all parties so that the job flows smoothly without interruption or conflict. The CM's primary role in this area is to monitor the critical path schedule so that essential activities have priority attention.

The second most common reason for considering Construction Management is to manage the project budget where there is an especially high degree of concern for cost control. By this we do not mean to imply that Construction Management will necessarily bring in a project any cheaper than traditional methods. Rather, Construction Management will enable us to have a higher level of certainty of a project's cost throughout the design process. Construction Management helps us set priorities when we have to match a tight budget with an ambitious program. Cost control during construction occurs through careful monitoring of bids and payments, and through quick, judicious resolution of conflicts in the course of construction. The management of construction costs also ties into the management of quality as well as the schedule. Quality is controlled through careful review of submittals, on-site inspections, etc. The CM's early familiarity with the design helps him anticipate quality problems. In summary, the key to successful management of a tight project budget lies in the control of time, cost and quality.

A third reason for considering Construction Management relates to the technical complexity of the project. At Penn State, small projects or projects that are very straightforward in scope, program, or construction technology are normally not considered for Construction Management. We feel

that Construction Management gives us better control over the quality of complex projects in that it provides for better design reviews. Design review should be an intense process that covers many points of view. With a CM you have another set of eyes to look at the project while it is still on paper and easily corrected. The CM brings expertise in "constructability" to the team. Furthermore, the CM does not have his ego tied to the design concept and therefore can offer a perspective quite different from that of the architect. During the construction phase, Construction Management can package complex projects in such a way as to get the best possible combination of specialty trades and contractors.

The fourth reason to consider Construction Management on a particular project relates to the Owner's capability to manage the project. At Penn State we would prefer to handle all projects through an in-house team of project managers, contract administrators and quality control personnel. The facts of life are that we cannot carry sufficient in-house staff to cover the highs and lows of our university's construction workload. We use Construction Management to fill in-house gaps in personnel or specific expertise as the need dictates.

We at Penn State find the flexibility offered by CM to be one of its biggest benefits. Perhaps we need help only during the design phase, so we hire a CM to do constructabilty reviews and value engineering. Perhaps we only need help during construction, so we hire a CM to monitor the schedule and provide on-site inspection. There is a trade-off which must be recognized in the use of any outside consultant. A consultant tends not to have the same organizational accountability as a member of your in-house staff. This loss of direct control can be unsettling to some not familiar with the CM process. In addition, certain of your internal administrative procedures may need to be modified to deal with this new way of doing business. CM is not right, nor is it required, for every job, but it does provide a way to gain better control of time, cost and quality than would be possible otherwise with tradition methods or available in-house staff.

Case Studies

Our experiences with Construction Management over the last several years have given us added insight regarding the assets and liabilities of the process - insight into what Construction Management can and cannot deliver to the owner with regard to management of time, cost and quality. We do not use Construction Management on every Penn State project. We use it as a tool to deal with delicate, or difficult management problems. These case studies reinforce our basic premise that Construction Management is a tool, not a panacea. You will see that the use of Construction Management does not guarantee a problem free project. On the other hand in each of the following cases, the use of Construction Management has made significant contributions to the project's ultimate success.

University Hospital East Addition

This $23 million dollar/100,000 square foot hospital addition includes: three surgical intensive care wards, a same day surgery admitting unit, a pain management center, inpatient admitting and discharge facilities, the main hospital lobby and gift shop, and a prosthetics fabrication and fitting facility. The project was completed three months after the original completion target of July 1991. We were well pleased with this outcome given that the additional period absorbed a one-third increase in the scope of work. In terms of cost, the project was fraught with challenges. The end result was a handsome facility, that well fits the user's needs and expectations of quality and cost. Hospital projects tend to be natural candidates for fast-track Construction Management. The need to get a revenue generating facility on line as soon as possible is always a driving force. Most hospital projects are technically complex and difficult to estimate. Finally, there is the factor of quality. The Pennsylvania Department of Health upholds a high standard of quality for hospital construction. It is not uncommon for projects to fail the first round of Department of Health inspections. In this context, the extra inspection afforded by Construction Management has avoided weeks of delayed occupancy.

Library Expansion

This project involved constructing an addition to a library that was effectively surrounded by an in-progress construction project. The $2 million dollar library expansion Construction Management contract was an attractive alternative to what would otherwise be a change order on a conventionally bid $46 million dollar Biomedical Research Building (BRB). Thus, the BRB General Contractor became the Library Expansion CM. A fast-track approach was essential to integrating a late breaking design into ongoing construction within fixed budget parameters. We believe that Construction Management yielded considerable savings over the change order alternative. All the same, integrating the two project schedules has not been without difficulties. The Library Expansion was first anticipated to be completed seven months ahead of the Biomedical Research Building. We are currently projecting a four month delay on the Library project.

University Physicians Center Phase II

This $19 million dollar/100,000 square foot outpatient facility has been a classic Construction Management success with one notable point of difficulty. It so happens that the project's Construction Manager is also the local area's largest general contractor. This general contractor also happens to be the most effective structural concrete subcontractor in the region. Our decision to maintain a separation between the financial interests of the Construction Manager and the trade contracts led us to seek bids from alternate structural concrete firms. As a result we are having to deal with a less effective structural concrete firm that is struggling to keep up with the schedule. This situation is not all that uncommon in smaller construction markets where a single firm can dominate several

sectors of the market while simultaneously offering their services as a Construction Manager.

Operating Room Renovations and Addition

This $11 million dollar program to add four new operating rooms in existing space plus provide renovated space for recovery and support could have never been possible without the use of Construction Management. This project combines all of the technical complexity of operating room construction with the problems of renovation - such as having to deal with asbestos containing materials and limited documentation of existing conditions. There is also the ever present need to maintain a safe patient care environment within operating rooms adjacent to the work site. We have never tackled a more difficult or delicate project. The Construction Management process has minimized the time spent on reassessment of scope of work and has freed Owner, Architect and Construction Manager alike to focus primary attention to the details of design and construction.

Beaver Stadium Addition

This is a 10,200 seat/$12.1 million dollar addition to Beaver Stadium. Construction started November 1990 and was completed August of 1991. Construction Management was selected on this project because of schedule constraints and coordination requirements. Results were very good; the project was completed on time and within budget. There were some structural problems which were uncovered after the project was completed. Difficulty was encountered in resolving these problems due to mixed responsibility for inspection of the project between the CM and the engineer. Construction Management Agreements must clearly spell out responsibility for inspection.

Nittany Lion Inn

This $18 million dollar addition to an existing on campus hotel facility includes 132 new guest rooms, a 500 seat banquet room, 3 large conference rooms, a health club and a new informal lounge/eating area. The Construction Manager was selected for the design phase and worked with the architect on cost estimating, value engineering, etc. There were numerous changes made during the design process to keep the project within the budget. The Construction Manager was asked to develop a guaranteed maximum price (GMP) for construction of the project. At the time that this GMP was received, market conditions were very competitive and the University decided to bid the project in an effort to save funds for some additional work which was desired. The result was that we saved substantial money on bid day. However, as the project has progressed, there have been numerous problems in maintaining the schedule, coordination between the various prime contractors has been a problem, and there have been quality problems in many areas with the inspection responsibility falling back primarily on the University staff. There have been numerous change orders on this project; it was just recently occupied and final accounting has not been received, but it is

probable that the final cost may be more than what we actually saved through the bid process.

Research Office Building

This $2 million dollar/20,000 square foot commercial grade office facility was designed by a firm who had their own in-house construction group. The intent was to handle this job as a design-build type project. When we received the guaranteed maximum price at the end of the design process, the project was substantially over the budget. We decided to approach several other CM firms for proposals. A different firm submitted a lower guaranteed maximum price and built the building as originally designed with a $200,000 savings to the University.

Eisenhower Parking Garage

This $9 million dollar pre-cast concrete structure is an 800 space multi-story facility for staff parking during the day, and event parking in the evenings. It includes office space for the Department of University Security. Construction started in Fall of 1991 to be completed by August 1992. Construction Management was selected primarily because of schedule concerns. Project is currently under construction and on schedule for August completion date. There were numerous changes in the project during the design phase to keep the project within budget. There were problems during the negotiation with the construction manager concerning the GMP price. These delays could have cost us most of the time we saved by going CM. Some of the delays were due to the University's lack of ability to respond quickly to requests and proposals from the designer and the CM. Even though Construction Management can expedite the schedule, University Administration has to be willing to respond in a timely manner. For future garage projects, we are investigating the potential of a design build approach which may alleviate some of the problems that arose between the Construction Manager and the designer at GMP time.

Summary Comments

The market situation in the construction industry in the Northeast makes it very difficult to justify construction management or any other negotiated type of contract arrangement at this time. Competitive bidding is very attractive because of the extreme competition for available work. Recent projects which have been bid by the University have had high level interest from firms throughout the Northeast with as many as 20 firms bidding on major projects. The last three projects bid have all come in substantially under the University's estimate. This situation makes it very difficult to sell the administration on the benefits of Construction Management. However, those of us charged with administering the contract recognize that the low bid may actually be too low, which further complicates our problems in administering the contract and guaranteeing the quality product. We have had at least one instance where a low bidder has clearly attempted to make up money lost on bid day through change orders and

delay claims. In considering the question of Bidding vs. Construction Management it is very important to consider the total final cost including costs for administration and inspection as well as the actual construction cost.

We learned something about the need to tailor administrative procedures and contractual agreements to facilitate the CM process. We learned that much of the timesaving benefit of the Construction Management option may be lost if our administrative procedures are not geared towards the fast-track approach. We are currently endeavoring to find ways to bring our administrative review and approval procedures in sync with fast-track CM. We also learned that contractual language for Construction Management projects must be clearly spelled out, both in the CM agreement and in the professional agreement so that there are no gaps, conflicts or dual responsibilities with regard to inspection, review and ultimate responsibility for the project.

Construction Management is now accepted as the preferred method of construction by our hospital administration. In fact, we on occasion find ourselves in a situation where we are asked to justify why we have not chosen to use Construction Management on a given project. Our typical answer is that not all projects require the intensity of management that comes with the CM process. After all, while Construction Management is a useful tool to deal with difficult problems, it is not a universal panacea.

Establishment and Application of a University Standards Policy

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PART 1

For at least ten years, the institution had talked about developing an office space standards program. Observations had been frequently made to the effect that, "if we had only thought ahead, we could have avoided reinventing the wheel." However, no plan or program for the allocation, equipping, design or configuration of office space was adopted, and as is the case with many large organizations, we purchased numerous panel systems from various manufacturers. Some of these systems were powered, others not. Each purchase and installation had been made with little consideration of flexibility, interchangeability and long term costs and benefits. There were no benchmarks or standards as to the size of offices, what positions were allocated various sizes (or private offices), or how such offices were equipped.

FROM A DESIGN AND A FACILITIES PLANNING POINT OF VIEW, EACH ADDITION OF AN OFFICE AND EACH RECONFIGURATION OF SPACE WAS A NEW BEGINNING. FROM THE PERSPECTIVE OF STEWARDSHIP, THE PURCHASE, MAINTENANCE AND REPLACEMENT OF OFFICE FURNITURE AND ALLOCATION OF SPACE TO OFFICE FUNCTIONS WAS NOT MANAGED IN A COHESIVE MANNER.

In the spring of 1991, the University of Texas Health Science Center at Houston began planning for a relocation of the institution's executive offices along with a major portion of the general administrative offices. Recognizing that this move was probably going to be the occasion of the largest furniture purchase

and space buildout for a number of years, we sought to use it as the fulcrum from which to launch an office space standards program.

ONLY WITH A MAJOR PROJECT AT STAKE, WITH AN ADEQUATE BUDGET AND WITH THE COMMITMENT OF TOP MANAGEMENT COULD THIS PROJECT HAVE BEEN UNDERTAKEN.

With top management's commitment to using the move as leverage to develop and implement office space standards, we began the design phase of the project. Essentially, our goal was to provide a quality working environment at a moderate initial cost, while achieving long term cost efficiencies through lower total space requirements and lower costs for changes in the use of space.

The first phase in the design process was the establishment of a space standards committee to make recommendations to the chief financial officer. This committee consisted of individuals who would have the primary responsibilities for executing the first and subsequent applications of the standards program. The committee was chaired by the Director of Facilities Planning. The other three members included the assistant directors for the purchasing and construction services division along with one of the institution's architects. Thus, the committee provided a staff function to the CFO rather than as a consensus building mechanism.

The committee's first task was to select a manufacturer and a color scheme. Through consultation with major architectural firms and major corporate offices in the Houston area, it became clear that high quality systems furniture, including modular furniture for hard-walled offices, would best meet these many dimensions of quality space. Although having a high first cost and representing a radical change for many employees, this approach uses space more efficiently and is flexible, aesthetically pleasing, and cost-effective over this long run. It also became very clear that top management's commitment to using one line of systems furniture and one simple set of office configurations would be essential to obtaining both a quality environment and long term cost savings.

We obtained that commitment, and embarked upon an intensive investigation of manufacturers, manufacturing techniques, strength and durability of various products, fabrics and colors, costs, delivery times, installation techniques, electrical and telecommunications capabilities, and ergonomics. The Haworth "Places" line of systems furniture and file cabinets, along with Steelcase chairs were selected. We prepared a presentation board for top management and briefed them on the process and the rationale behind our recommendation. IT IS ABSOLUTELY ESSENTIAL THAT INSTITUTIONAL PERSONNEL ASSIGNED TO SUCH A PROJECT LEARN AS MUCH AS THEY CAN ABOUT THE OFFICE FURNITURE INDUSTRY AND THE OPTIONS THAT ARE AVAILABLE.

The committee's second task was to develop a recommendation for the sizing of workstations along with criteria for which positions would go into each workstation. The committee reviewed

the types of work that our employees do in order to design several typical office layouts. The committee recommended that all administrative and professional employees go into traditional hardwalled offices, and that classified employees go into workstations.

Classified employees are assigned various workstation sizes according to their status as "exempt" or "non-exempt" viz. FLSA overtime pay requirements, a distinction that in very general terms approximates the "professional" and "support" categories. Although some organizations with whom we spoke had many different configurations, we decided that our needs could largely be met by three basic systems furniture workspaces: a 100 square foot office for managers; an 81 square foot office for "exempt" employees (those for which overtime compensation is not required); and, a 63 square foot office for most non-exempt employees. Recognizing that some non-exempt employees have supervisory roles, we also recommended the 81 square foot office for non-exempt employees supervising two or more people. A fourth workstation, at 36 square feet, is also available as a temporary workstation.

After the committee's recommendations had been accepted by the chief financial officer, the university began the process of selecting an architect. The architect was to be responsible for programming the new work space, for developing schematic designs for the workstations, and for developing construction documents for the buildout. Six firms were interviewed, including larger general practice firms as well as smaller firms whose practice focused on interior design. We selected a medium size, general practice firm-Pierce, Godwin, Alexander and Linville (PGA&L)

The design work for the project was split among our staff architects, an outside firm (Pierce Godwin, Alexander & Linville), and a Houston area distributor for Haworth, Business Furnishings Company. Our architectural staff, with the assistance of a space standards committee, was responsible for developing a basic design for the workstations and for conducting workstation specific programming. The outside firm was responsible for the overall aesthetic image, for programming, for the functional layout of the space, and for preparing construction documents. The distributor was responsible for taking the workstation pods laid out by the architect, developing detailed drawings, and ordering and installing systems furniture based on these drawings. Coordination of these responsibilities was largely the responsibility of our project management staff.

The first order of business in working with the firm was programming. One common element identified by PGA&L early in the programming phase was duplication of files. A recommendation was thus developed and implemented to build a central file room. The move from old space to new space was essentially a one for one switch in rentable space, so client wishes for enhancements generally were rejected. Adjacencies were worked out with quite a bit of difficulty and several drafts. There were difficulties in

quality assurance in assigning employees to work stations, and review by our architectural staff proved to be essential to make sure that positions were assigned to the correct positions.

The next task was to develop schematic design. During this phase, the details of color schemes, fabrics, special architectural treatments, etc. were worked out. The emphasis at this stage was on a quality working environment. A quality working environment means many different things. It means a warm, inviting image to employees, students and visitors. It means individual privacy with opportunities for informal interaction with colleagues. It means public areas and individual office spaces that are artistic, elegant, generate pride among employees, and elicit the confidence of the public. It means office layouts that make efficient use of space while providing generous worksurfaces and storage spaces. It means state of the art telecommunications. It means flexibility to change things around as new missions are articulated and our job skills and goals evolve. It means temperature and humidity control that are both energy efficient and provide comfort levels needed in our climate.

During schematic design, PGA&L developed a general layout of the workstation pods. We elected to use window space as a common commodity, with hallways running along the perimeter of the building and workstations having considerable natural light. Only vice-presidents and the president have a private office with a window. Recognizing that factory authorized dealers and installers have superior knowledge of what works and what doesn't, along with superior CAD capabilities, we had an installer do the detail design of individual workstations based on pod layouts from the architect. creating elegant, tasteful, artistic and pleasant public areas. As built CAD drawings and detailed inventories are provided as a part of the installation price. Because of the variations in actual working duties and because the layout of buildings precludes a precise deployment of the standards in every situation, some exceptions to the general rule are essential.

Recognizing that responsibilities incumbent with each position vary considerably among these broad groups, programming interviews were held using our staff architects with each department affected by the move. Individuals have different working styles and work requirements, and these workstation specific interviews covered such items as worksurfaces, storage space and accessories. A range of options was given for each workstation. For example, a guest chair or additional work space could be interchanged for a five drawer lateral file cabinet.

The final product is characterized by subdued elegance in the public areas. Elevator lobby floors are done in granite, and special wall coverings are used. Art in public areas carries a consistent theme and complements the interior design. Corian countertops and ceramic tile walls and floors are used in the bathrooms.

Individual workstations and private office are both functional and aesthetically pleasing. Worksurfaces are generous, and there is plenty of room not only to lay out work but to personalize the office by placing photos, silk flowers, mementos, and artwork on these surfaces. Each panel system includes two contrasting tackboards, providing space for tacking up calendars, memos, schedules and other lightweight, non-framed items. Standard accessories include a coathook, a pencil drawer, and a fold-away keyboard tray. Storage space is also very generous, with several options available according to the size of the workstation and individual preferences. Private offices use modular furniture, and an allowance for artwork is provided along with a consultant to help in its selection.

This program is embarked upon at a time when university budgets are tight, and long term cost savings are a critical part of this program. Initial costs of systems workstations and modular furniture for hardwalled offices are relatively high, but cost savings accrue during their life cycle because of standardization of components (remember Henry Ford), ease of reconfiguration, and efficient use of space. A couple of examples of these long term cost savings will help illustrate what we mean. Every time a hard-walled office is relocated, the minimum cost of taking down and rebuilding sheetrock walls and reconfiguring the lighting, ventilation and electrical is $25 per square foot. For comparison's sake, it costs less than $2 per square foot to take down systems furniture and reconstruct it at another location within the same building. An office space standards program requires less total space per person than an unregulated program. Since university office space costs, at minimum, $10 per square foot per year to heat, cool, clean and maintain, these costs savings add up quickly as existing functions and new functions convert to the standard.

Maintaining our investment in the space standards program and maintaining the overall image achieved at initial occupancy requires the cooperation of occupants in adhering to a few operating requirements that are different from the previous office environment. There is more control and direction from the administration on what goes and what doesn't go within individual offices than was previously the case. The fabric panels will be damaged if anything is attached to them; they are "non-tackable." A tackboard is included within each workstation for that purpose, but is not strong enough to hold pictures and photos. The tops of the workstations will deteriorate if items are taped to them, and we ask for your assistance. Water from plants has damaged many wooden desks in the past, and live plants cannot be a part of our new environment. The overall image of the office will be compromised if items are placed on top of file cabinets and overhead storage bins. Finally, our warranty will be voided if individuals attempt to reconfigure things themselves. Repairs, alterations, reconfigurations, etc. will be handled by a certified installer, as approved by the Office of Facilities Planning and Capital Projects. The university will contract for monthly and

annual servicing of Systems furniture.

Achieving the long term cost savings upon which this program is predicated will require a level of central management and review of office space that is new to the university community. For the executive, administrative and support functions of the university, adherence to the standards will be mandatory whenever moves occur or space is reconfigured. The modification of the standards for use in academic departments is presently under study.

Systems furniture will not be on departmental inventories and will instead be owned by the Department of Facilities Planning and Capital Projects. Any moves, additions, or deletions will be handled by this department and approved by a space committee consisting of top university officials. A space standards manual was developed to ensure that future buildouts will be consistent and that the office space standards will be maintained over time.

PART 2

Shortly after the Institutional Standards committee began the task of establishing University standards, the first opportunity to apply the program presented itself.

The general administration offices of the Health Science Center occupied approximately 45,000 sq. ft. in a building that belongs to another state agency. Because of the expansion of that agency, our administration began looking for alternative space. Four floors of a building where we already had a significant amount of space leased became available for the relocation. The decision was made to completely demolish the existing space and start anew. This also gave us the perfect opportunity to start a project using the new standards from the ground up.

After the decision was made by the President to move, the project team was assembled. The initial team included a Project Manager, the Director of Facilities Planning, one of our in-house architects, and myself. The first charge to the team was to select an outside architectural firm with experience in implementing a standards program.

A Request For Proposal was prepared and mailed to a number of firms in the Houston area. The proposal asked for experience, examples of previous work of this type, references, photos, and a list of the principals that would be involved and their resumes. We received five proposals and began the review process. The team narrowed the selection to the three finalists and contacted those

three for an on-site presentation. The presentations were spread over a three week period to allow critiquing of each. The team developed a form we used to evaluate and score each group. After all three were finished the team spend a great deal of time reviewing each one. Finally a selection was made and negotiations began for a contract. From the time we started the process till a contract was signed took approximately six weeks.

The next portion of the process was the most painful. It involved the programming and design of the space. The architects spent hours upon hours inside the departments which had been identified as ones to move. The architects had a number of forms and questionnaires which they filled out during the interview process. After the interviews were complete they began designing the space. The design was to take into consideration the departmental needs, contiguity within the space, and the overall objectives of the project.

The programming and design phase was where the most "spirited" discussions and debates took place. This is also where we had the most problems with the architects. Even after they had spent a great deal of time with the client departments, the project team, and senior management concerning programming issues, they still could not get the proper adjacency. We spend untold hours correcting their mistakes and doing redesign. This was also one of the areas that caused us the most heartache with the clients. Each time an area was completed, the architects would have the department review the design. Invariably the department manager would call us about how the architects had "screwed up their space". There was a lot of time spend holding hands with the clients and reassuring them that everything would be alright.

The design phase took approximately two months to complete. There were meetings held at least weekly, usually more often, to review the latest design. Many, many changes were made at these meetings. Also during this time the decisions were being made on fabrics for chairs, panels, wall coverings, and tack boards. Decisions were also made on types of chairs, tables, accent pieces, desk accessories, sitting areas, lamps, drapery, AV equipment, and a hundred other details. This is where you find out what kind of taste different people have. Sometimes it's quite a shock.

After all the design decisions were made and the architects began work on the construction documents, the team began the process of updating the clients as to exactly what their space would look like, the type furnishings, and their location within the floor to which they were assigned. The education process was very difficult. The standards had been published, pictures of the systems taken, and many briefings held but the customers could not accept the idea that all the work stations were going to be basically the same. We finally had mock-ups of the work stations build in our Stores area and ran shuttle buses so that everyone in each department had the opportunity to see, touch, and feel the space. This helped but there were some people whom we could not

have pleased with anything we did. We tried to be as accommodating as possible because we realized up front that this was a very traumatic thing for many individuals.

When the design reached the schematic stage we began to select a general contractor. This portion was handled in large part by the architects. They developed a RFP and sent it to a number of firms with whom they had past experience. After the proposals were returned, they prepared an evaluation and came to the project team with a recommendation based on experience and profit/overhead mark up. Because HSC senior management was wanting to fast track this project we issued a cost plus contract to the recommended vendor.

When the CD's were complete and the permits obtained, we finally began actual construction. All four floors followed the same basic plan. The first thing done was the restrooms. They were all brought to ADA standards and refurbished. Next came the lobby areas. In the design phase it had been decided that the same theme would be carried throughout the floors because all portions of the project became institutional standard. The lobby areas consisted of granite floors with a common pattern reflected in the ceiling design as well. The same design carried over to the glass in the doors. Next came the hard wall offices and the open space. During the construction phase there were twice weekly meetings with the architects, engineers, project managers, and the contractor. This is were we answered questions, made clarifications, field changes, etc. Some of these were very intense meetings. The project got off to a rough start because of problems between the architects and contractor. There was a lot of finger pointing and back biting at this stage about who should have done what and when.

In the beginning there was a real lack of communication between the architects, owners, and contractor. The instructions we gave to the architect did not always get to the contractor in a timely manner. There were problems with long lead items not being ordered when they should have been and everybody trying to spread the blame. After we got past this stage and senior management of the contractor became involved, things smoothed out somewhat. It wasn't a great relationship but it was better.

The actual build out went about as smooth as could be expected in a project of this size. It required an enormous amount of on-site time by the project manager. There were hundreds of decisions that had to be made in the field. It helped that the PM was there as much as he was. We made many modifications as we went along. We discovered a lot of things that we never had taken into consideration such as window coverings. The plan was to leave the windows uncovered because of the light and because there is a nice view from the floors. We had not considered what the glare would do to a PC screen. We wound up putting mini-blinds on the windows. There were many other examples as well.

When the furniture began arriving for installation a whole new series of problems arose. Because we were moving into a commercial

building we had problems with delivery access, elevator use, even trash disposal. Again, the PM spend nearly every minute on-site while the work stations were being assembled. There were a lot of field changes made at this time also. We tried to be as accommodating to our clients as possible and still maintain our standards. It involved saying "NO" a great deal. Fortunately senior management generally backed us up when our answer to a question or request was appealed.

Finally the time came when we had to make the first move. This process took hours and hours of planning and coordination. Everything from telephone transfer to network set up had to take place in the proper sequence for the move to be successful. Each of the four moves were scheduled in the same manner. On Thursday evening a person from network services would go around to each person that was to be moved that weekend and disconnect their PC and other equipment and prep it for moving. Early Friday morning we began moving PC's in order for the network people to have all weekend to set them up for work on the following Monday. During the day on Friday, the people moving would pack boxes. The actual moves took place on Saturday. This allowed freer access to the buildings and elevators. Each persons boxes were marked with their name and new office location and the movers had maps of the new areas and placed the boxes where they belonged. On Monday morning when the people reported to their new work areas all they had to do was unpack their personal boxes and go to work.

The time from the start of design to move in of the first department was about seven months. The final moves took place in March but we were still receiving the final pieces of furniture into April and May.

After all the hard work, arguments, disagreements, change orders, and griping that have taken place over the last seven months, we believe we have delivered to our employees a pleasant, efficient, and functional environment in which to work. And the biggest majority of the people are very pleased with their space. A lot of the people that were unhappy with the move in the very beginning are still unhappy but I doubt there is anything we could have ever done to satisfy everyone.

As in any project of this nature there is a tremendous amount to be learned in the process. The main thing we would do different is not try to use a fast track approach and issue a cost plus contract. We didn't save any time and probably spent more money than necessary. We also didn't do a very good job of communicating with the people being effected by the changes. We should have involved them more in the design phase and in establishing the standards we used. This may have eliminated some the hostilities encountered.

About the time the original project was winding down we began another remodeling effort in one of our HSC-owned buildings. This will involve approximately the same square footage and number of

people as the first move. The difference this time is that we are doing this as an in-house project using our own craftspersons and designers. We are still using the established standards but we are making minor changes, adjustments and fine tuning where necessary. However, the basics of workstation size, furnishings, fixtures, and procedures remain the same. With this project we are trying to use what we learned on the first one and to improve upon each time we do one of these.

FACILITIES OPERATIONS

Building a Base for Change

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Director, Physical Plant Division
Virginia Commonwealth University

Michael P. Onder
Eastern Regional Director
MGT of America

Virginia Commonwealth University (VCU) is a major state aided institution with an enrollment of over 21,000 students, or 17,600 FTE students. A 1968 state legislature directed merger of the Medical College of Virginia (MCV) and Richmond Professional Institute (RPI) created Virginia Commonwealth University. VCU operates two separate campuses in the urban Richmond area. The MCV Campus, comprised of what was a separate institution, the Medical College of Virginia, is located in the downtown core adjacent to City and State government buildings. The Academic Campus, which was previously RPI, is approximately two miles away in a primarily residential setting with low to high socio-economic residents.

The Physical Plant Division, formally part of the Facilities Management Division (FMD) currently maintains 126 buildings, 37 of which have national and/or state historic designation, and nearly 5 million square feet of floor space on 93 acres.

CULTURAL ENVIRONMENT

The culture of FMD was somewhat unique in that the physical plant organizations on each campus were totally independent and considered themselves different from each other. In the years since the 1968 merger, most administrators and faculty accepted the concept of one university, and most programs were integrated at the university level.

However, the physical plant organizations on each campus saw little change. Each continued to operate separate maintenance shops, had separate preventive maintenance systems and had different working relationships with the work control organization. Additionally, a construction department in FMD provided all renovations and managed contractor construction work. This department had fully equipped trade shops, including a cabinet shop in the same building as the MCV Campus physical plant cabinet shop.

This fostered a culture of intense behind-the-scenes competition between these three organizations, while at the same time uniting them against organizational changes that they felt would challenge the status quo. Within each of these organizations subcultures developed, generally by trade areas. This resulted in reduced cooperation between shops and a tendency to blame others for work site problems. A feeling of competition between trades is common in the American construction industry, and to a lesser extent in many large physical plant organizations, and is not necessarily detrimental to the organization. However, the intensity and depth of that competition at VCU was so great that a major void in coordination and communication existed. Indeed, this was the major reason that attempts at work force scheduling were ineffective. This resulted in poor work site coordination and a perception by customers of incompetence in FMD.

Recommendations for streamlining the organization in 1985 by a peer review team, and in 1987 by a consultant, were not implemented. The Division attempted to coordinate and streamline its activities, but with little success. In addition to the perceived need for the organization to sustain itself by maintaining the status quo, other reasons for not meeting these earlier goals were the long standing lack of operational procedures, the lack of consistent policy enforcement, and the lack of accountability.

FOUNDATION FOR THE PROJECT

A catalyst in the effort to modernize the operations of Facilities Management was the establishment of a Panel of Inquiry in 1988 by the Governor of Virginia. The Panel was charged to investigate various complaints of poor management and supervision in the Facilities Management Division. The Panel recommended that a consultant be hired to review such things as:

- lengthy chain of command which promotes circumvention of supervisory levels,
- communication patterns and management styles that may surprise employees when unilateral decisions are made,
- the need for productivity and performance standards,
- development of flexibility in the purchasing of supplies and materials needed on a daily basis.

The leadership of VCU and the Division took steps to correct the deficiencies noted through their own inquiry, the Panel's findings, and the internal audit recommendation for standards development. The steps taken by the Division helped to lay the groundwork for a consultant to begin the process of review, assessment and recommendation.

PRE-STUDY ORGANIZATION

At the time the study was commissioned, the Facilities Management Division was headed by an Assistant Vice President under the University's Senior Vice President. The heaviest concentrations of the Division's 774 employees were in the housekeeping and maintenance departments. Figure A (on the following page) illustrates the Division's organization at that time.

Two key management positions, Director of Physical Plant Operations and University Architect, were vacant at the time of the study. The positions remained vacant pending the outcome of this study. The majority of employees were assigned to work responsibilities on the MCV Campus, with 294 full time employees, and 224 hourly employees. The Academic Campus, with half that number, had 191 full time employees, and 65 hourly employees.

The comprehensive review and analysis study was conducted in 1989 by MGT of America, Inc. and pointed again to the need for written policies and procedures, the need to enforce those policies, and the need to hold employees accountable for their actions. The MGT study also identified specific organizational and operational cultural characteristics that would have to be addressed in order to implement the needed changes that had been identified through several previous studies.

These organizational cultural ingredients were:

- Communication limited to a significant few,
- Cliques that helped reinforce the philosophy of separate, noncooperating organizations,
- An appraisal system that had no relationship to performance,
- A hiring and promotion system that rewarded friendship before qualification and merit.

In addition to these organizational cultural ingredients there were also operational cultural ingredients that were firmly ingrained in the Division. Key among them was the fragmented approach to service delivery.

Organizational units tended to coexist with one another rather than planning, coordinating, and working together. Each unit tended to operate as a separate entity

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FACILITIES MANAGEMENT DIVISION
PRE-MGT OF AMERICA

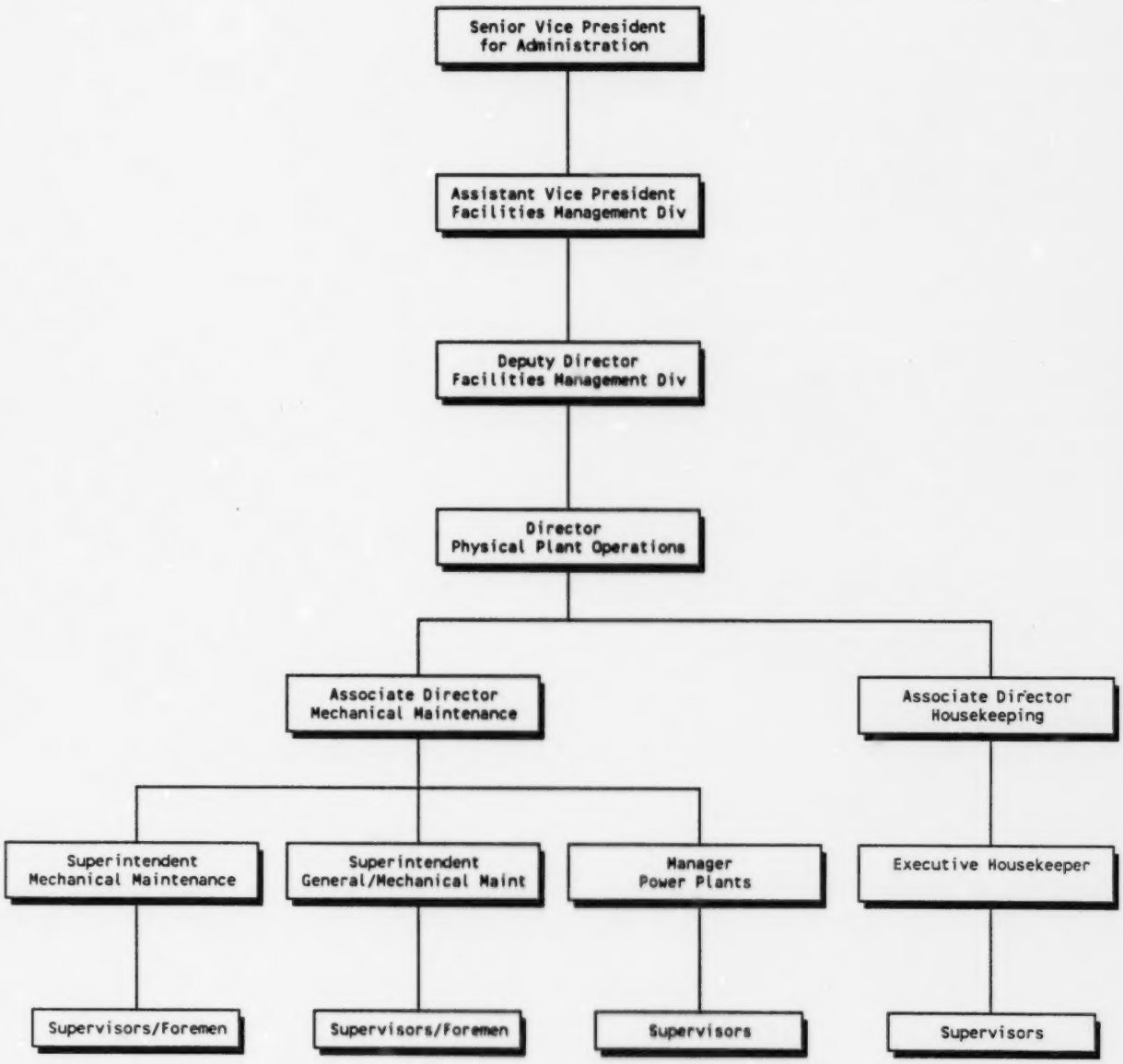

Figure A

unto itself, attempting to serve in a rudimentary manner distinct customer groups. Customer groups were served on a friendship basis, to the exclusion of the real priorities on campus. Additionally, trade shops on each campus with the same craft responsibilities as those on the other campus operated completely independent of each other, duplicating many services.

The physical plant department maintained duplicate full service painting, plastering, carpentry, sheet metal, electric, plumbing, and HVAC shops on both the Academic and MCV Campuses. The construction department maintained full service carpentry, plumbing, electric and sheet metal shops; both within the same building and within two blocks of the maintenance shops on the MCV Campus. There were no specialized work requirements that necessitated duplicate shops or a separate construction division.

Duplicate shops, along with hiring and promotion based upon friendship rather than qualification or merit, helped to create an organization that suffered from extremes of span of control.
Some foremen supervised as many as 17 craft persons. Some supervised as few as five. There was no established method for distribution of manpower.

Lost time and inefficiencies became the norm as a result of the fragmented delivery of services. Tracking work orders in 18 separate shops was not an easy task even if an efficient work order control system was in place. As a result, work orders got lost, or significantly delayed. Supplying materials to maintenance and/or construction teams generally resulted in foremen and leadmen conducting supply runs to local supply houses, without regard to a coordinated material management process. When analyzing all purchases the division made over a seven-month period, the campus warehouse had only a 1.8 percent usage rate. Such poor usage rate was not only indicative of low confidence in the warehouse system but also a high level of operating independence of individual shops on both campuses.

A key concern that was identified early in the study was the wide gap that existed between the expectations for service from the faculty and staff and the ingrained culture that dictated how services were to be delivered. In a survey conducted of faculty and staff, a large percentage said they had occasional to frequent contact with the Facilities Management Division and were familiar with the services. Nearly 75 percent complained that major improvement was needed on response time to get the job done and follow-up inspection after the job was presumably finished. The employee survey showed just the opposite. Nearly 96 percent of the employees responding said they understood their job and completed work in an acceptable manner. The problem was diagnosed as a severe case of uncoordinated communication.

STUDY RECOMMENDATIONS

VCU's Facilities Management Division was a classic example of an organization suffering from distrust. An attempt to fix the problem by adjusting individuals at the very top of the organization was not the answer. There had already been six physical plant directors over a nine-year period. The fix for the organization required adjustments at the very core of the operation. The critical needs that were identified by the consultant were to:

- consolidate maintenance and construction shops
- create area customer service coordinators
- standardize span-of-control
- develop written procedures
- develop a customer service manual

As an offshoot of the process to consolidate shops and standardize span-of-control, it became apparent that more supervisory positions existed than were needed. As an added recommendation, the consultant identified a potential reduction of 29 supervisory positions. No reductions were recommended at the non-supervisory levels. However, after the shops were consolidated, it became apparent that staff reductions in most shops were required.

REORGANIZATION IMPLEMENTATION

With the study recommendations, FMD management developed a position paper of support for the project, and the University President took the recommendation to the Board of Visitors. With the Board and top management backing the project, the University entered into an agreement with MGT of America, Inc. to implement recommendations. An implementation plan was developed that realistically allowed shops consolidation and personnel changes to be accomplished within a year and a half. Along with this, an advance of $300,000 was approved to provide overlap to fill new positions prior to disposition of existing positions.

The reorganization plan was designed to fill newly established or reorganized positions from the top down. The top positions of physical plant director and the newly created positions of assistant physical plant directors were all unfilled at the beginning of reorganization. The project implementation team wrote the physical plant director's job specification and had the position recruited for and filled. The director then became a key member of the implementation team.

In the new Physical Plant Division the director, assistant directors, 5 out of 7 shop superintendents, and 19 out of 36 supervisors and foremen were new to their positions.

The campus coordinators and manager of work control were also new during this 20-month reorganization period. Being able and having the commitment to transcend the formal organization was a key element in recruiting these individuals. While the director and assistant directors were from outside VCU, most of the other positions were filled with internal candidates.

The individuals in these positions are the change agents who are using the best aspects of the former culture in developing the new physical plant team culture based on a customer service oriented philosophy. A key premise in this new culture is that physical plant team members are customers of each other. Management and supervision empowers team members to the maximum extent possible. Individuals are reminded that when they are on a job, they are physical plant in the eyes of customers. They are encouraged to use professional judgement and when appropriate, make commitments for physical plant. Many individuals accept this new challenge willingly and become team members. They enjoy a new sense of pride in the University and the Division. Some, however, are uncomfortable with the concept preferring specific duties and tasks and don't want to take the risk that accompanies responsibility. Successful supervisors understand this and assign tasks and duties accordingly. This process reinforces those who embrace empowerment and the customer service philosophy. Gradually as mutual trust grows more individuals are becoming team members in this sense. Others probably will never become fully integrated team members.

This new organization is shown in Figure B on following page.

CASE STUDIES

Accomplishing all of the tasks necessary to make implementation successful required several case studies to be conducted on an interrelated basis. The case study approach helped focus attention on the task at hand. Since several individuals served on task forces that dealt with several case studies, it also helped to maintain a level of separation of discrete subjects. The case studies consisted of:

- Developing Policies and Procedures
- Developing a Work Order Control Plan
- Consolidating Craft Shops
- Developing Supervisory and Management Positions
- Developing an In-Service Training Plan
- Developing a Maintenance Employee Transportation Plan
- Developing Improved Communication

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PHYSICAL PLANT DIVISION
POST-MGT OF AMERICA

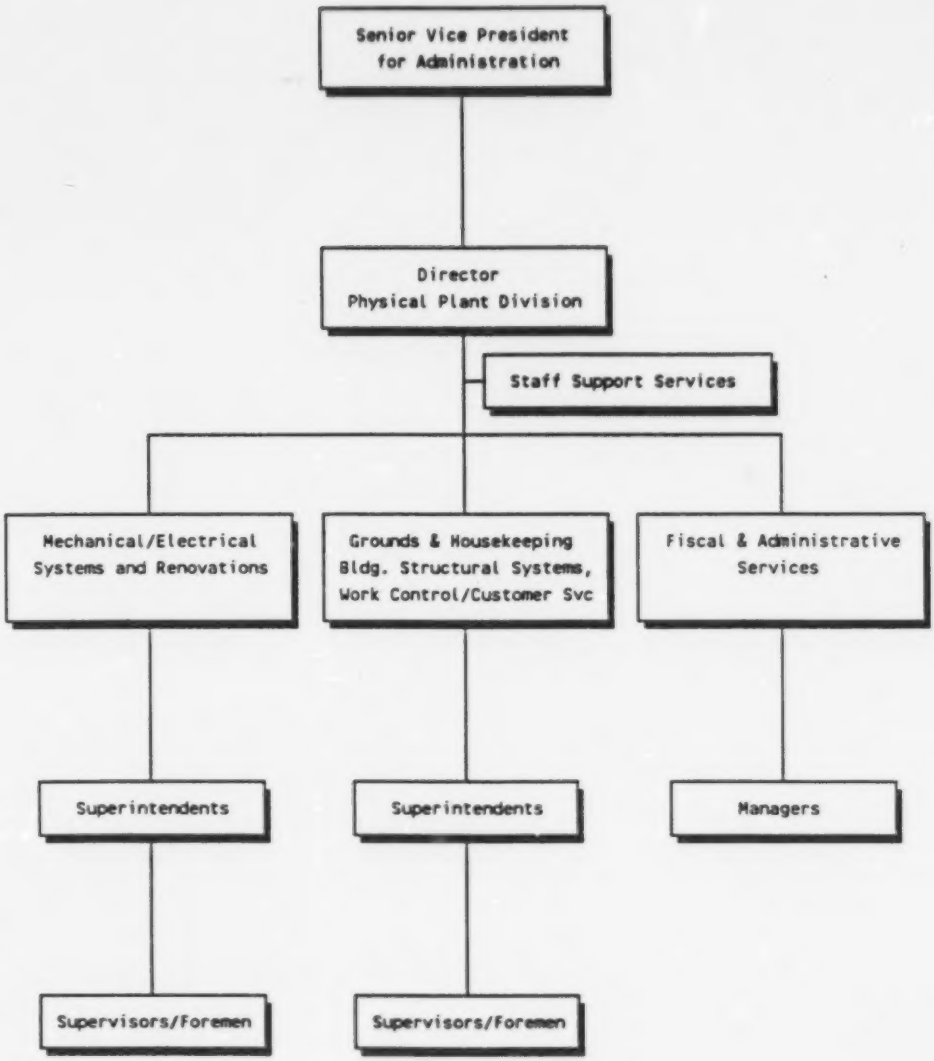

Figure B

DEVELOPING POLICIES AND PROCEDURES

Employee buy-in is critical to the successful implementation of any reorganization. Without it the recommendations are viewed as promoted by outsiders who will eventually leave, not by insiders who will have to live with the new structure and its rules and regulations. With this in mind the VCU reorganization plan included employee input through each step of the process.

Four policy and procedure development teams were assembled to address, 1) Work Control, 2) Accounting/Payroll,3) Material Management, and 4) Administration.

Each team worked independently of the others with specific assignments given prior to each meeting. The MGT implementation manager served as facilitator for each team. The VCU project manager and physical plant director served on each team and provided continuity and guidance on state or other University rules and regulations.

The work of the teams provided the basic elements for and resulted in the establishment of a written guidelines system to assist not only FMD employees but also University customers in the facility support process. It also set in motion a change in expectations for those working within the guidelines, and holding those who do not accountable.

A WORK CONTROL PLAN

The initial MGT study found a rudimentary work order control system that had only recently been developed and processed approximately 1,500 work orders per week. The computer support consisted of a homegrown LOTUS program running on an IBM AT machine. There was some shared information that was logged onto an IBM minicomputer. However, this machine primarily served as an electronic distribution vehicle for work orders to the shops. Work scheduling was performed on an individual shop basis; work order tracking did not exist, except at perhaps the foreman level. An effective system to close out work orders did not exist. On reimbursable work charges were accruing on some accounts five years after the originally intended work was completed.

To help alleviate customer service problems compounded by a fledgling work control center, the work reception and dispatching functions were consolidated into a Customer Service Center. Individuals in the Customer Service Center had little training in customer service relations. A manager with significant skills in customer service relations was given responsibility for the Customer Service Center and began a retraining process that has been met with praise from the customers on campus.

Estimating, which had a several month backlog of work to be estimated, refocused work efforts utilizing national work estimating guidelines and standards. This, with more focused leadership, reduced the time most work was in backlog waiting to be estimated to less than two weeks.

Work force scheduling for multi-task renovation and construction jobs was consolidated in a renovation management group. This group schedules and coordinates all shop work, subcontracts job elements to contractors or contracts out entire projects as necessary, supervises multi-trade field work, and performs quality control of projects.

DEVELOPING SUPERVISORY AND TECHNICAL JOBS

The team was not able to anticipate the delays that would occur through the dynamic process of running an organization, having major budget cuts imposed, and revising the implementation plan. The project team had to reassess the original classification of job duties, and decided to take the writing of job specifications for the management and supervisory positions as a team responsibility. The classification process was delayed several months but resulted in the development of a well integrated management structure for the Physical Plant Division.

DEVELOPING AN IN-SERVICE TRAINING PLAN

Coordinating the development of an effective and realistic training plan took the cooperation of the University training department in the Human Resources Division.

The plan developed by the project team and the VCU training department consisted of management and supervisory training, a technical certification program, an apprenticeship program, technical on-the-job-training, employee orientation, and operations training. Funding limitations have delayed implementation of many of these programs.

DEVELOPING A TRANSPORTATION AND MATERIAL SUPPORT PLAN

Consistent with the fragmented approach to maintenance, a central supply and material acquisition operation did not exist within the Physical Plant organization. A culture had grown up within the Division that expected foremen and leadmen to conduct supply runs. In the new organization the changed expectation is that foremen provide leadership, supervise and direct the work force. Material support is provided from the warehouse or commercial vendors primarily by supply runners and vendor deliveries.

A transportation plan identifying type and number of vehicles required to serve customers on both campuses from the consolidated shops was developed.

DEVELOPING IMPROVED COMMUNICATION

In order to help alleviate the symptoms of uncoordinated communication that was found through study surveys, building managers were designated for each building or major group of buildings. Daily communications was established between them and the newly created physical plant campus coordinators. Periodic communications occur between them and the physical plant director and his assistants, and semi-annual conferences have been established for open forum discussions. These activities have

proven very beneficial toward improving the physical plant/University community relationship. Additionally, the need for a customer service manual was identified to provide a reference source for facility policies and other requirements for obtaining service.

WHY REORGANIZE

The basic mission of physical plant organization is to create and maintain a physical environment in which the university can most effectively accomplish its education, research and community services missions. Rather than focusing on maintaining and operating facilities, the physical plant organization should focus on services provided to the whole university community. Included in this is construction, maintenance and operation of buildings and grounds, but service is the key word.

This service must be provided in the most effective and efficient manner possible. Generally, duplication of shops and services is not cost effective and can lead to detrimental competition between organizational elements for resources, recognition and credit.

The physical plant organization must be sensitive and adaptive to changes in the educational mission and external forces. Changing demographics, increasing regulatory requirements and more restrictive budgets require physical plant organizations be sharply focused on their service mission.

When the University community perceives that the service mission of physical plant is not being met in an effective and efficient manner, a comprehensive review of the physical plant organization may be appropriate. When shops and services are being duplicated or when competitive services are available from vendors, a review of the organization may be appropriate. Employee dissatisfaction and low morale are often associated with poor service and may be an indicator of a need for an organizational review.

Restructuring, consolidation and reorganization can be traumatic for those involved and should only be undertaken when a clear services-related need for reorganization is identified.

HOW TO LIVE WITH REORGANIZATION FOR THE DURATION

Any reorganization will cause dislocation and employee concerns. A major commitment from University administrators, and other affected policy makers and/or state administrators outside the institution is essential for a successful transition. The transition can also prove to be counterproductive without detailed planning and publicity prior to implementation. A plan that provides phased implementation and status feedback to employees, faculty, and staff can provide an environment of enthusiasm and productivity while everyone strives to meet established goals.

One of the keys to successful implementation is the provision of University level oversight until the plan is fully implemented. To provide for such management it is essential to

- appoint an implementation committee from the larger University community to provide oversight and continuity in the implementation of study recommendations.
- designate a professional level individual to conduct staff work for the committee, answer questions about the new structures and processes, and assist management as appropriate.
- adopt a well documented organization plan which clearly defines each affected individuals new responsibilities.
- swiftly execute a realistic implementation plan to build positive momentum and the critical cohesive forces necessary to see the plan through.
- on-going management and monitoring of the plan, by a third-party facilitator or implementation manager, until the plan is fully implemented.

PRIORITIZING CHANGE

Development of an implementation plan brings with it the critical task of prioritizing those activities that must occur on a phased basis.

If reorganization means consolidating functions and preparing new job specifications for management, there will be an overlap period that must be considered. This overlap period has additional costs associated with it that will need to be budgeted.

Another priority in any major overhaul of an organization includes identifying the supporters and detractors as early as possible. The supporters must be reinforced with consistent positive change, and placed judiciously with the detractors for reorientation and cultural adjustment.

Parallel to identification of supporters is the need for the person responsible for reorganization to have at least one, if not several, trusted lieutenants. The task of implementing a reorganization is very demanding and requires attention to detail, and can frustrate the most focused and determined individuals. Organizations tend to preserve the status quo. Changes must be carefully implemented and the individuals involved must be fully reinforced, otherwise lasting change will not occur.

CONCLUSION

As presented in this paper, the task for building a base for change is the beginning of a long and intensive process to reorient an existing culture to meet the newly defined demands of customer expectations.

In order to make the change, it takes commitment and leadership. Commitment is needed to stay the course and, leadership is needed to find the right path through an obstacle course that is littered with distractions.

There has been a modicum of success that we have realized at VCU. A base has been built for change to take place to meet new customer expectations. However, there are still elements of the status quo that fight for survival, and there are those who wonder if the new way is better than the old way. We respond to those concerns with the foundation elements that have been built to correct employee and customer complaints of the past. Fairness and equity for all physical plant employees have been built into the system. Communication enhancements have been made within physical plant, and between physical plant and VCU customers. The basis for conflict between shops has been eliminated. Hiring practices are focused on qualifications and experience. Promotional practices are focussed on merit. All of the elements that distracted us from customer needs have been retooled and returned to employees with different perspectives. Trust and empowerment of team members to becoming accepted and expected; this is our base for change, with it we are beginning to satisfy customer expectations and make the needed adjustments to continue to meet those expectations without further major disruptions to the organization. The disruption that we had to go through was necessary, because resistance to working cooperatively and recognizing customer needs was too heavily ingrained in the old FMD organization. Without a major shift, the new successes that we are now realizing would not have been possible.

Transportation Management at Cornell University

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Cornell University

Introduction

- Cornell University is a large teaching and research institution located in Ithaca—the Finger Lakes region of Central New York State.
- Cornell is home to some 12,000 undergraduates, 6,000 graduate students, and 10,000 faculty and staff.
- Ithaca is a small city in a rural county.
- Cornell is the largest employment center and premiere tourist attraction in Tompkins County.
- It is among the largest employers in a six county area. Tens of thousands of people commute to Tompkins County, Ithaca, and Cornell every day.
- Over the last twenty years suburban sprawl has resulted in more employees moving to many surrounding bedroom communities. The traffic coming to Cornell has grown beyond the abilities of the circulation infrastructure to handle it.
- Cornell is over 125 years old, nestled between two gorges, and was not designed with the present volume of traffic in mind.
- Explosions in technology require that Cornell build state of the art facilities to remain on the cutting edge of research and education.
- Cornell which is already a sprawling campus must look to a logical expansion that keeps central campus reserved for academic facilities.
- Parking areas on central campus are being reclaimed for academic structures.
- Even as demand for parking grows, available parking diminishes
- Building new parking now is environmentally unsound and prohibitively expensive.
- Surface lots, depending on size, cost $2,000-$4,000 per space to construct and upwards of $350 per year to maintain (including debt service).
- We're running out of appropriate sites. Parking garages cost over $10,000 per space to construct and underground parking costs over $25,000 per space to construct.
- Cornell's options were to invest in this parking or find a way to make it unnecessary.
- It is actually less expensive initially, and over the long run, for Cornell to essentially pay its employees to commute more efficiently.
- On July 1, 1991, Cornell's Office of Transportation Services instituted the Transportation Demand Management Program (TDMP). What follows is a history of that implementation:

-the specific problems and challenges facing the university
-the solution including rejected ideas
-tests; a discussion of the development process
-program details
-support services which make TDMP accessible to more people
-results; including environmental and financial benefits
-the future; including potential support services that will incorporate even more participants

The Problems

- Growth in traffic congestion and parking demand beyond capacity.
  - -20,000 vehicles/day were coming to the Cornell campus
  - -Cornell is located in the city of Ithaca (pop. approx. 30,000)
  - -infrastructure on and around campus was not designed to handle flow
  - -convenient parking is becoming an increasingly hot commodity
- A 1989 university planning study projected a need for 2,500 additional parking spaces over the next 5 years.
  - -up to 2,000 spaces could be lost due to new construction—more efficient use of land
  - -the densely developed central campus is the area of highest demand for parking and new facilities.
- Cornell has an obligation to responsible stewardship of its greenspace.
  - -mandate from trustees
- Need to create and/or maintain user access and convenience.
  - -university guests
  - -conferees
  - -visitors to campus—prospective students, alumni, etc.
  - -scholars coming to libraries
  - -community members coming to or traversing the campus
- Need improved inter- and intradepartmental interaction.
  - -need to set priorities—as demand grows and available parking decreases
  - -who truly needs adjacent parking?
  - -lack of central clearinghouse for conferences and parking arrangements
- Building new parking is expensive and exacerbates traffic problems.
  - -encourages more traffic
  - -Cornell has encountered political opposition in the past when planning a new parking lot
- Need to maintain good relations with neighboring communities.
  - -increased traffic
  - -parking on streets to avoid fees
- Concern for the safety of thousands of pedestrians that traverse Cornell daily.
  - -17,000 students
  - -10,000 faculty and staff
  - -mainly a walking campus
- Damage by single-occupant vehicles is staggering.
  - -environmental—we are becoming more aware the damage done by automobiles
  - -infrastructure—more use damages and less able to repair—time of fiscal crisis
- Funding sources (gifts, tuition, grants, and state allocations) are not available for parking improvements.
  - -friends and alumni want names on buildings, not parking lots
  - -moneys come from ever decreasing general fund and from fees
- Campus expansion will continue horizontally.
  - -as money gets tighter, the university has to spend more to remain competitive
  - -new buildings and facilities
  - -denser development of central campus

-expansion into undeveloped areas
-many of the prime building locations are currently parking lots
-clean air legislation mandates decrease in vehicles when building is renovated

The Solution

- Many options were considered, but were rejected as being environmentally or financially unsound, or otherwise unacceptable.
  - -Build enough surface parking spaces to meet current and upcoming demand. *Every additional 80 to 100 spaces devours an acre of greenspace. Increased parking lots lead to increased runoff onto the underground water supply. Building more parking encourages more automobile traffic and associated pollution. The increases in parking fees—necessary to pay for the added parking—would have been in excess of 20 percent per year for ten years.*
  - -Pay a cash reward to Cornell faculty, staff, or affiliates who placed zero demand on the system by finding their own alternate means of commuting (e.g. riding with a neighbor who is not employed at the university and being dropped off, or walking or biking to work, etc.). *Extensive debate suggested that this option would be expensive and would financially reward people who could afford to live within walking-distance of campus.*
  - -Convert student parking spaces to faculty and staff spaces and bar students from bringing cars to Cornell. *The growth in parking demand is due to staff who desire more convenient space, rather than by resident students who park in more remote areas.*
  - -Build large parking facilities, some of them underground, to allow everyone to park on or near the central campus. *As with surface lots, this option increases traffic and public safety concerns; increases demand on infrastructure; and encourages greater use of single-occupant vehicles. Additionally, underground parking facilities can cost as much as $25,000 to $30,000 per space to construct.*
  - -Construction of a people-mover or monorail system. *Construction costs for systems of this type range from $5 million to $15 million per half mile.*
  - -raised parking fees (three-tier rate structure, local market level)
  - -converted most previously no-fee spaces to fee spaces
  - -fully-subsidized transit for in-county staff who turn in parking permit (OmniRide)
  - -partially-subsidized transit for out-of-county staff who turn in parking permit (OmniRide)
  - -carpool incentives: discounts or cash rebates on parking fees (RideShare)
  - -reward employees who only rarely bring their car to campus (Occasional Parker)
  - -it is possible for most employees to take advantage of the demand management program if they are so inclined. Besides the support services will be discussed later, over 60 percent of all employees live in communities which contain at least 200 Cornell employees.

The Tests

- OmniRide pilot: Fall 1990—worked with a Cornell fieldwork course.
  - -tested concept of OmniRide with a selected group of individuals
  - -interviewed participants before and during the pilot project
  - -interviewed consenting individuals who declined the offer
  - -introduced program with a letter from the highly respected Senior Provost who had turned in his exclusive parking permit and was taking the bus.
  - -gave away incentive
  - -required participants to turn in their parking permits, but gave a 30-day bailout option with a guarantee of returning parking permit.
  - -created marketing materials
  - -identified concerns of individuals who did not participate
  - -identified concerns of individuals who did participate

-test-marketed emergency ride service (now an integral part of TDMP)

- Rallied the support of local leadership.
  - -community leaders were pleased that traffic through their neighborhoods would be reduced and that transit service would improve.
- Enlisted aid and cooperation of surrounding municipalities.
  - -a large percentage of Cornell's employees commute from the outskirts of and outside of the county
  - -received assistance in designating bus stops
  - -parking areas were made available for park and ride lots
- Held a total of over 80 meetings on campus to hash out ideas.
  - -worked with campus governance groups, employee committees, administration, local community groups (including neighborhood associations and town, city, and village planning groups), local leadership (mayors and supervisors), and held open forums
  - -listened to concerns and suggestions
  - -we were able to implement some of the suggestions before TDMP went into effect
  - -the emergency ride service, the free "A" lot option, the "Commuter Connection" classified ads, and the Parking Hardship Review Board all grew out of concerns voiced at these meetings (these are described fully under "support services")
- Worked with campus governance groups to finalize proposal.
  - -took the recommendations and made a draft proposal
  - -several interactions produced a refined document which was passed by the assembly and forwarded to the president for approval
- Worked with municipalities to determine if they would accept demand reduction in lieu of building additional parking.
  - -Cornell is breaking new ground with the city of Ithaca. Zoning ordinances are being reconsidered in light of environmental concerns. This will help regarding clean air legislation.
- Student OmniRide pilot program Fall 1991.
  - -one of the major concerns with the TDMP is that it only included staff and didn't reduce student demand.
  - -many systems and accounting reasons why it is difficult to include students
  - -we promised to eventually try to bring students into TDMP
  - -in the fall of 1991 we began this process by offering a student OmniRide pass
  - -students pay for the pass which allows unlimited use of all buses in Tompkins county
  - -most of the student population is residential or live within walking distance of campus
  - -a limited number commute a longer distance; it was this group we targeted for the pilot project

The Programs

- OmniRide (transit incentive)
  - -By securing the cooperation of city, county, and other municipal bus services, Cornell has been able to offer its employees (and, in a recent pilot program, some students) partially- or fully-subsidized transit. Membership in OmniRide is displayed in the form of a sticker on the employee's identification card. That sticker allows him or her to take any bus in Tompkins County to any place at any time, and Cornell pays the fare. OmniRiders are not restricted to using OmniRide only during the work day, they may use their OmniRide pass any time the buses run: during the day or on evenings or weekends. OmniRiders also receive, at no cost, ten one-day parking permits every six months, in case they occasionally need to bring a car to campus. Out-of-county commuters pay a subsidized fare for travel outside the county, but still receive all of the in-county benefits.
- RideShare (carpool incentive)

-RideShare provides incentives for carpooling with other Cornell faculty, staff, or affiliates (see chart 1). Like OmniRiders, RideSharers receive, at no cost, ten one-day parking permits every six months for those days when carpooling doesn't work out.

Chart 1

	Individual Permit Holder	Two RideSharers	Three RideSharers	Four or More RideSharers
A Lot parking	**no charge**	**no charge**	**no charge**	**no charge**
Perimeter parking	$180 fee	**no charge**	$90 rebate	$180 rebate
East-central parking	$270 fee	$90 fee	**no charge**	$90 rebate
Central parking	$360 fee	$180 fee	$90 fee	**no charge**

- Occasional Parker
  - -Employees who don't purchase an individual parking permit and who don't participate in OmniRide or RideShare—because they are dropped off on campus by someone who is not an employee, or because they walk or bicycle to campus—may choose to become an "Occasional Parker." Occasional Parkers receive, at no cost, 10 one-day parking permits every six months. All they need to do to qualify is register their cars with the university.

The Support Services

- The various components of the TDMP exist pretty much as originally envisioned. The support services were implemented to address the concerns and problems that were brought to our attention throughout the development process.
- *Ithaca Area Transit Map*
  - -Cornell's Office of Transportation Services—in an effort to promote the use of transit—spearheaded the production of a comprehensive transit map for Tompkins County
  - -map includes all of the routes serviced by six transit operators and their varied subcontractors
  - -all city, county, and university routes
  - -shows the extensive network of public transit serving Tompkins County
  - -includes general route information for each route
  - -indicates fare information
  - -introduced a universal bus numbering system
  - -blurs distinctions among providers and concentrates on the service availability
  - -includes phone numbers to call for specific route and schedule information
- Park and Ride lots (*"The bus doesn't stop near my house." or "It's out of the way for the person I RideShare with to pick me up."*)
  - -Cornell worked with surrounding municipalities to gain their cooperation in designating park and ride lots.
  - -provide a convenient location to meet a RideShare group or to pickup an OmniRide bus.
  - -parking in these lots is ample and free.
  - -if an individual lives in a location so remote as to necessitate driving, they need not drive all the way to Ithaca; traffic can be reduced in the most congested areas

- "Commuter Connection" classified column to help build or increase RideShare groups (*"I want to RideShare but I don't know anyone to RideShare with."*)
  - -Cornell University has almost 10,000 staff members; it is possible that an individual you don't know can have a similar commute and similar work hours.
  - -the "Commuter Connection" is a rideboard that runs monthly in the employee newspaper
  - -the university's computer information network contains up-to-date listings as well
  - -individuals can create or increase their RideShare group using these classified ads
  - -ads include municipality of origin; the individual's first name; work telephone number; days and hours; whether they prefer to drive, ride, or share responsibility; and smoking/nonsmoking preference.
- One remaining, peripheral, no-fee lot for staff and faculty (*"I can't afford to pay for parking."*)
  - -one 663-space lot—the "A" lot—which is a ten-minute bus ride from most work locations, has remained a no-fee lot.
  - -the "A" lot was available to all employees during the initial program enrollment
  - -it is now available by special request
  - -the lot has yet to reach capacity
- Parking Hardship Review Board can give out grants (*"I can't afford to pay for parking and I can't park in A lot; it's too far away and I need access to my car during my work day."*)
  - -partial or full grants to pay parking fees are available
  - -petitioner must prove financial need; an inability to use OmniRide or RideShare; a need to have ready access to their vehicle
- Dependent care giver assistance (*"I bear the high costs of being a dependent caregiver; I have to take care of my parent/spouse or my child is in childcare. I need access to my car. It is marginally possible for me to RideShare."*)
  - -we recognize the financial, time, and perhaps emotional burdens associated with being a dependent care giver.
  - -we want to give these individuals a way to participate in the TDMP
  - -we offer individuals with documented dependent care needs (either dependent- or child-care) double RideShare incentives
  - -the double incentives apply if even one member of the RideShare is a dependent care giver
- Volunteer firefighter/EMS personnel assistance (*"I can't participate in TDMP because I need access to my vehicle and an individual parking permit to fulfill my duties as a volunteer firefighter/EMT."*)
  - -the university provides release time for volunteer emergency fire and medical personnel
  - -Transportation Service's traffic bureau has always given emergency volunteer personnel priority, adjacent parking.
  - -now, volunteers can also receive a rebate on their parking fees, equal to one-half the perimeter rate, for documented service in the previous fiscal year (July 1 to June 30)
- Emergency ride service (*"What if I need to get home or to my child's school for a family or medical emergency?"*)
  - -this was by far the greatest concern, primarily among parents
  - -employees were afraid of being "stranded" on campus without their car
  - -we instituted the emergency ride program at the same time as the OmniRide pilot project
  - -we have vehicles and staff available to take people where they need to go
  - -service operates Monday-Friday 7:30 a.m. to 5:00 p.m.
  - -employee need only call 255-RIDE
  - -so far only about one employee a week has required this service

The Results

- We have achieved a high level of participation.
  - -1219 faculty and staff participate in OmniRide
  - -1324 faculty and staff are in 617 RideShare groups
  - -27% of Cornell's faculty and staff are participating in these programs
  - -22% fewer single occupant vehicles are coming to campus each day
- Tremendous reduction in energy consumption and emissions (see pages 8-10 for environmental details). Daily and yearly figures (there are 244 work days in a year):
  - -41,141 fewer miles are traveled every day (10,038,404 fewer miles/year)
  - -1,708 fewer gallons of fuel consumed every day (416,752 fewer gallons/year)
  - -CO_2 emissions reduced by 27,750 lbs./day (6,771,000 lbs./year)
  - -CO emissions reduced by 2,668 lbs./day (650,992 lbs./year)
  - -oxides of nitrogen reduced by 140 lbs./day (34.160 lbs./year)
  - -hydrocarbon emissions reduced by 242 lbs./day (59,048 lbs./year)
- The decrease in single-occupant vehicles not only reduces fuel consumption, but it also makes energy usage by transit more efficient.
  - -buses are more full than they were before the inception of OmniRide
  - -passenger-miles per gallon have increased
  - -this is more efficient use of transit-aid funds as well
- Only one form of emission increased.
  - -particulate emissions increased by 3 lbs./day (732 lbs./year)
  - -caused by bus route and schedule expansion
- Education—one of the cornerstones of the program was the effect that it has on staff members' pocketbooks. It has been an effective way of gaining their attention. Once, we had their attention, we were able to teach them that:
  - -for every 80-100 parking spaces we have to cover one acre with asphalt
  - -roads and infrastructure deteriorate and must be repaired
  - -more traffic means that roads need to be widened (and trees hewn down)
  - -there are hidden costs in operating single-occupant vehicles (insurance, environment, depreciation, wear-and-tear)
  - -responsible commuting can reduce our dependence on foreign oil
  - -in order to provide responsible stewardship of or campus and preserve our greenspace, we needed to reduce traffic and parking demand
  - -as we increase our constituents' energy awareness, responsible use of resources becomes a genuine selling point for the program
- Financial savings (see page 11 for financial details)
  - -in addition to the environmental benefits, our financial projections have told us (accurately to this point) that it costs us less and will save us tremendous sums of money to essentially pay people to come to work rather than to build new parking.
  - -in the first year we have saved over $53,000
  - -next year we project savings of $28,000
  - -because we have managed demand and reduced the need for new parking, by the third year we should save over $1.1 million
  - -over the subsequent 20 years if we keep TDMP in place we will save an additional (beyond the $1.1 million) $56,000 per year (less TDMP increases).

VEHICLE EMISSION CHANGES FROM THE TRAFFIC DEMAND MANAGEMENT PROGRAM

VEHICLE TYPE	FUEL TYPE	MILEAGE CHANGE mi/day	FUEL CHANGE gallons/day *	CO2 EMISSION CHANGE lb/day	CO EMISSION CHANGE lb/day	NOx EMISSION CHANGE lb/day	HC EMISSION CHANGE lb/day	PART. EMISSION CHANGE lb/day
CAR	GAS	-35773	-1431	-23374	-2227	-126	-197	0
LIGHT TRUCK	GAS	-5824	-324	-5266	-492	-27	-50	0
VAN	GAS	209	21	320	45	3	3	0
BUS	DIESEL	247	26	571	7	10	1	3
NET CHANGE		-41141	-1708	-27750	-2668	-140	-242	3

CO2 - CARBON DIOXIDE
CO - CARBON MONOXIDE
NOx - OXIDES OF NITROGEN
HC - HYDROCARBONS
PART. - PARTICULATES

ASSUMPTIONS, METHODOLOGY, & REFERENCES

VEHICLE AND FUEL TYPE

INFORMATION RECEIVED FROM CORNELL UNIVERSITY TRAFFIC BUREAU (ATTACHED).

MILEAGE CHANGE

INFORMATION RECEIVED FROM CORNELL UNIVERSITY TRAFFIC BUREAU (ATTACHED).

EMISSION CHANGES

EMISSION CHANGES CALCULATED USING EMISSION FACTORS FROM THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION AND OTHER REFERENCES. SEE ATTACHED DATA TABLE.

HEAVY TRUCK GAS EMISSION FACTORS USED FOR VANS.
HEAVY TRUCK DIESEL EMISSION FACTORS USED FOR BUSES.

* - FUEL ECONOMY ASSUMPTIONS: CAR = 25 MPG, LIGHT TRUCK = 18 MPG
VAN AND BUS DATA FROM TRAFFIC BUREAU

PETER D. PARADISE 1/31/92
ENVIRONMENTAL ENGINEER
CORNELL UNIVERSITY
DEPT. FACILITIES ENGINEERING

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VEHICLE EMISSION FACTORS

VEHICLE	FUEL	HYDROCARBONS grams/mile				CARBON MONOXIDE grams/mile				NITROGEN OXIDES grams/mile				CARBON DIOXIDE
		summer	spr/fall	winter	average	summer	spr/fall	winter	average	summer	spr/fall	winter	average	calculated ** gm/mi
CAR	GAS	2.5	2.5	2.5	2.5	20.4	32.3	32.3	28.3	1.3	1.7	1.7	1.6	297
LIGHT TRUCK	GAS	3.7	4.0	4.0	3.9	29.3	42.9	42.9	38.4	1.8	2.3	2.3	2.1	411
HEAVY TRUCK	GAS	8.2	5.7	5.7	6.5	100.3	95.3	95.3	97.0	5.6	6.3	6.3	6.1	696
HEAVY TRUCK	DIESEL	2.6	2.6	2.6	2.6	12.7	12.7	12.7	12.7	17.7	17.7	17.7	17.7	1050

VEHICLE EMISSION FACTORS RECEIVED VERBALLY 1/30/92 FROM :
MIKE KEENAN
SR. ENVIRONMENTAL ENGINEER
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF AIR RESOURCES
ABATEMENT PLANNING

DATA WAS FROM COMPUTER MODEL MOBILE 4.1 RUN BY THE NYSDEC.
SUMMER TEMP = 84.7 F
SPRING/FALL TEMP = 62.1 F
WINTER TEMP = 37.8 F
DRIVING SPEED = 19.6 mph

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** - CARBON DIOXIDE EMISSION FACTOR CALCULATED FROM TYPICAL FUEL COMPOSITION DATA.

REFERENCES:

LIPTAK G. BELLA, ENVIRONMENTAL ENGINEERS HANDBOOK, VOL2: AIR POLLUTION,
CHILTON BOOK CO., PA, 1974

P.D. PARADISE
1/31/92

Pre-TDMP Data August 1990

Individual Permits	8600	89%
Bus Riders	500	5%
Carpoolers	500	5%
Other (walk, bike,)	100	1%
TOTAL FACULTY & STAFF	9700	100%

Post-TDMP Data December 1991

Individual Permits	5835	64%
RideShare	1365	15%
OmniRide	1333	15%
Occasional Parkers	144	2%
Other	400	4%
TOTAL FACULTY & STAFF	9077	100%

Assumptions:
Data does not include students.
These numbers are estimates.
Hiring freeze in effect from November 1991 to January 1992.
Average number of people in pre-TDMP carpool is 2.0.
Average number of people in post-TDMP carpool is 2.14.

Increase in Number of Buses

Route	Vehicle Type	Miles/Day	Miles/Gallon
Tomtran to Lansing	1991, van, gas, 14 passenger	90	10
	1991, van, gas, 14 passenger	90	10
Tomtran to Danby	1991, van, gas, 14 passenger	29	10
T-Tran to Owego	1991, bus, diesel, 36 passenger	111	9.5
T-Tran to Waverly	1991, bus, diesel, 40 passenger	136	9.5

Assumptions:
Only includes AM and PM peak commuter trips for each route.
90% of occupants on these trips are Cornell employees enrolled in OmniRide.
With the exception of the addition of the above routes, the increase in the OmniRide program was absorbed by prexisting capacity.

Decrease in Number of Cars
Before TDMP 8600 + 500/2 = 8850
After TDMP 5835 + 1365/2.14 = 6473
Decrease 8850 - 6473 = 2377

Assumptions:

Percentage of Driving Employees	Average One-Way Commuting Distance
55%	5 miles
35%	10 miles
10%	25 miles

86% of driving employees use an automobile, 14% use light trucks.

	Without TDMP	With TDMP	In Year Savings
Spaces Needed, 91-92	**1,300**	**200**	
Cost to construct @ $4,000/space	$5,200,000	$800,000	
Debt service @ 9% for 20 years	$569,642	$87,637	
Space maintenance @ $65/space	84,500	13,000	
Cost of TDMP Programs	N/A	500,000	
1991-92 added cost to budget	$654,142	$600,637	
Total added cost to budget	$654,142	$600,637	$53,504
Spaces Needed, 92-93	**0**	**0**	
Cost to construct @ $4,000/space	$0	$0	
Added debt service	$0	$0	
Added space maintenance @ $65/space	0	0	
Added cost of TDMP Programs	N/A	25,000	
1992-93 added cost to budget	$0	$25,000	
Total added cost to budget	$654,142	$625,637	$28,504
Spaces Needed, 93-94	**1,200**	**1,000**	
Cost to construct @ $ 4,000/space	N/A	$4,000,000	
Cost to construct @ $12,000/space	$14,400,000	N/A	
Added debt service @ 9% for 20 years	$1,577,469	$436,186	
Added space maintenance @ $70/space	84,000	70,000	
Added cost of TDMP Programs	N/A	26,250	
1993-94 added cost to budget	$1,661,469	$534,436	
Total added cost to budget	$2,315,611	$1,160,073	$1,155,538
1994-95 and beyond			
Avg. spaces needed per year	**200**	**50**	
Cost to construct @ $4,500/space	$900,000	$225,000	
Added Debt service/year	$98,592	$24,648	
Added Space maintenance/year	14,000	3,500	
Added Cost of TDMP Programs	N/A	27,562	
Total added cost/year	$112,592	$55,710	$56,881

The savings achieved is, therefore, $53,504 in 1991-92, increasing to $1,155,538 by 1993-94. In addition, the cost of providing only 50 spaces per year instead of 200 after 1993-94 will yield an additional savings of $56,881/year (less TDMP increases).

- Additional benefits
  - -cooperation among transit companies, necessary to launch OmniRide, has led to the development of the *Ithaca Area Transit Map.*
  - -a shared transit maintenance and administration facility is in the final stages of construction. City, county, and university bus services, as well as a volunteer-operated transit service for the disabled will be housed under one roof
  - -in addition to working with Ithaca and Tompkins county planners and transit operators to make commuting by bus and carpool a viable option, we are working with all transit service providers who operate in four adjoining counties and serve Cornell
  - -because of OmniRide, six separate transit operators are getting the benefit of greater state and federal transit assistance, due to fuller utilization of transit capacity
  - -all bus services are using nearly all available capacity, and are putting new services in effect where needed
  - -the program has already earned city and county praise and has inspired them to encourage other local employers to duplicate Cornell's efforts
  - -other local employers can take advantage of the lessons learned at Cornell and implement their own OmniRide program (either a free or discounted bus pass) easily, because all local transit operators are accustomed to accepting Cornell's passes
  - -TDMP is transferable. These programs illustrate how different campuses and municipalities can reduce traffic congestion through the use of better transportation management strategies

The Future

- Fine tuning
  - -the program is set with a five-year commitment
  - -the basic premise will not change
  - -we will continue to develop more support services so more people can participate
  - -we will continue to promote the programs
  - -we continue to listen to feedback, and improve TDMP
- Improving visitor parking
  - -although we concentrate on reducing vehicles on and around campus, we do not wish to discourage visitors
  - -visitors can be dignitaries, scholars, alumni, job recruiters, potential students, researchers, media, or even local guests
  - -all of these visitors mean something special to the university and bring it some benefit
  - -most are not all day visitors and have multiple stops to make. We cannot park them on the outskirts of campus
  - -we need to be welcoming and have sufficient proximal parking for them
  - -instead of constructing new parking, we would prefer to convert central employee lots to visitor spaces.
  - -employees can use the campus transportation system to get from their car to their worksite. Staff who need access to their cars can be accommodated
- Bicycles
  - -bicycles which are a great alternative source of transportation, are not yet a part of the TDMP
  - -a major report, *Cornell Cycles* has just been completed by members of Transportation Services working in conjunction with other university departments
  - -this plan contains recommendations on how to incorporate bicycle planning into the other aspects of physical plant planning at the university
  - -bicycle parking and routes for the campus are discussed at length
  - -in addition to the incentive of a more "bicycle friendly" atmosphere that will evolve at the university as a result of *Cornell Cycles,* Transportation Services is looking to include bicycles in the TDMP to provide a financial incentive to bicycling

- Pedestrians
  - -Cornell will continue to emphasize the concept of the "walking campus"
  - -as the central campus becomes more densely populated and developed, and support and administrative functions are moved to the outskirts, central campus will have an increasing number of pedestrian/transit plazas where there are currently roads
- Creation of a campus "taxi" service
  - -a major reason that people have given for being unable to participate in TDMP programs is that they need their personal vehicle near their worksite for business-related errands during the day
  - -for risk management and insurance purposes, among others, it is not beneficial to the university, for people to use their personal vehicle s for business
  - -Transportation Services plans on instituting a campus "taxi" service
  - -departments might be charged for employee use of these vehicles
  - -this system will provide portal-to-portal service
  - -riders will not have to worry about the ability to find close parking spaces for loading and unloading
  - -because departments will pay by the trip rather than reimburse for mileage, departments will be forced to reevaluate the necessity of some trips
  - -the "taxi" service could function as a courier or taxi service, carrying people, items, or both
- Increased student participation
  - -because of time and logistical constraints we have been unable to include students in these programs
  - -the student OmniRide program pilot was successful, we are encouraged by that success
  - -eventually if we can work out a system we would like to incorporate students into the RideShare program
- Reassess need for new and replacement parking
  - -if TDMP is as successful as current indications show, perhaps we won't need as much new parking as we have anticipated
  - -replacement parking may or may not be necessary, based upon demand

Time for a (Landscape) Tuneup?

David K. Scatterday
Senior Landscape Architect

Cathy Walker
Horticulture/Landscape Management Consultant
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Today's landscape managers are faced with many new challenges. With tighter budgets, stronger government regulations, and heightened environmental awareness you need to step back and evaluate what you are managing and how you are managing it. There is no better time than now, to "tune-up" your landscape maintenance operation. This 50-point inspection will enable you to easily evaluate and improve your campus aesthetics, organizational strategy, equipment, maintenance techniques, and tools for managing in-house or contracted labor.

EVALUATE THE LANDSCAPE DESIGN

The landscape design most obviously affects the site's appearance but, rarely do designers, managers, or owners consider the impact of the design on long-term maintenance. More than 75 percent of all landscape dollars spent over the life of a landscape are spent on maintenance. In contrast, most emphasis and analysis are placed on the design and installation phases. Before any landscape is installed it should be evaluated for its maintainability, and maintenance costs should be calculated.

Inappropriate design, improper materials and cutting corners during installation usually result in escalated maintenance costs within a few years. A common problem is when soil preparation is overlooked. Eliminating this step means poor growing conditions, which leads to continuous renovation of lawns and replacement of trees and shrubs.

Poor design does not always directly result in increased cost. For example, if the desired aesthetic effects are not achieved, then the time and money that went into the design, installation and maintenance, was wasted.

Evaluating new plans before installation can save time and money, but it is never too late to evaluate an existing landscape and make changes. When evaluating a design, look for these items:

Trees and Shrubs

1. Are trees and shrubs planted too close to pavement or buildings? When trees and shrubs are planted too close to pavement or buildings, they can cause structural damage to pavement. Trees become high maintenance when they must be continuously pruned to keep branches from encroaching traffic areas or rubbing against buildings. Transplanting or complete removal may be viable solutions to this maintenance problem.

2. Are trees and shrubs planted too close to each other? Planting too close together can cause plants to crowd each other. Shrubs may actually die if they become too crowded. Trees become deformed and lose their natural shape as they compete for sunlight. In a new planting, money can be saved when plants are properly spaced, because fewer will be needed. In existing plantings, selected plants should be removed, allowing remaining ones to reach their full potential. When a woodland or grove-like appearance is intended, tree spacing is not critical. However, for a grove-like appearance, it is best to choose one type of tree and avoid interplanting evergreen and deciduous trees.

3. Are there individual shrubs planted in lawn areas? Individual shrubs planted in lawns are visually distracting and create extra trim work for the mowing crew. If they are close together with turf between them, simply create a mulched bed around the group of shrubs. This will improve the appearance and eliminate trimming. If they are planted too far apart they should be removed or transplanted into groups and mulched.

4. Is this the right plant for this space? Improper plant selection greatly increases maintenance. Plants that are too large for the area or have an inappropriate habit require more pruning to keep them inbounds. These plants should be removed or transplanted to a more suitable location. Plants that have messy fruit, foliage or brittle wood, also add to the landscape staff's workload. Plants that are susceptible to disease and insects or are intolerant of the growing conditions will need special treatment to keep them alive and eventually require replacement. Usually, special treatments such as insecticides, fertilizer injections, soil conditioners and fungicides are time consuming, require the use of expensive materials and a highly trained staff to apply them. If these maintenance intensive plants are not in key areas, or are not of significant economic value, removing them will begin to save money immediately.

5. Are shrub beds or tree rings too small? Do the branches of the plants extend into the lawn? This problem requires extra time for the mowing crew and can be eliminated by simply enlarging the bed so it extends several inches beyond the branch tips. It is not productive or aesthetically pleasing to prune plants to fit within the existing bed. If tree rings are too small they may look out of scale. As a rule of thumb, a tree ring should be six inches in diameter for every one inch of trunk diameter.

6. Are tree rings and shrub beds excessively weedy? Is exposed soil time-consuming to cultivate? Mulching shrub beds and tree rings with an organic type of mulch, such as pine needles, shredded hardwood or cedar can inhibit weed growth as well as help retain moisture and keep the soil temperature more constant.

It is our opinion that weed barriers between mulch and soil are not worth the investment and labor to install. However, if any type of weed barrier is to be used, it should be the mesh-type that will allow moisture and oxygen to move through it. Black plastic should never be used as a weed barrier.

7. Have trees and shrubs been improperly pruned? Although hand pruning may seem more labor intensive, overall, it is actually less labor intensive. Once plants are sheared, they need to be sheared at least two or three times during the season in order to maintain the shape created by the initial shearing. Also, shearing shortens the life of many plants. They become dense at the growing tips and lose their interior foliage and the foliage at the bottom of the plant. The most cost-effective designs allow plants to retain their natural shape and size while pruning only to maintain health. Consider the design intent before pruning. If it results in an undesirable appearance, even if the proper technique is used, time was wasted. This can be avoided by developing pruning appearance guidelines and communicating these to your staff. See Form A for a sample pruning guideline.

Flower Displays

8. Have the proper flower colors been selected? Too many colors in one area can become distracting. It's more visually pleasing to stick with one, two or possibly three colors. They can be contrasting (yellow and purple), complimentary colors (orange and yellows) or various tones of the same color (red and pink).

9. Does the flower color create the desired effect? Different colors have different visual impact—they create a mood and emotional response. For example, bright colors such as reds, pinks, yellows and oranges are very eye-catching. They attract your attention because they are very dominant colors in the landscape. They create a feeling of excitement and energy. These colors are most appropriate at entry signage and in beds where they would be viewed from a distance. These colors tend to be best in bright, sunny areas. Pastel colors—the light pinks, lavenders, purples and blue colors, as well as green, tend to portray a feeling of relaxation and are not as visible from a distance. These colors should be reserved for courtyard areas, where students may gather to study or sit and relax.

10. Are the flower beds readable from the primary viewing distance? If flower beds are meant to be viewed from an elevated vantage point or from a roadway, the colors need to be vibrant and the beds need to be large. Enlarging beds and planting larger areas of one color will improve readability.

11. Have the proper flower types been selected? Proper plant selection is crucial to efficient maintenance and aesthetic appeal. If shade-loving flowers are used in sunny areas, they tend to take need more water and do not grow and flower as well as sun-loving types. If water is not available, select flowers like Vinca, *Melampodium* or moss rose that are very tolerant of dry soils.

Flowers that are disease- and insect-resistant are also less maintenance intensive. A good example is the multiflora petunia, one type being the Madness series, which is very resistant to *Botrytis* blight and also recovers from the beatings of the wind and rain much better than the grandiflora types. Another example of a disease resistant annual would be the French type marigolds. Compared to the African type marigolds, the French type have a smaller flower and generally looser petals. They do not hold as much moisture so they are less likely to suffer from *Botrytis* blight. The African types have large flowers that tend to hold moisture, encouraging *Botrytis*.

Select perennials, ornamental grasses and bulbs to replace some of the annuals. This will eliminate some of the expense and time involved in yearly flower planting.

12. Have the flowers been properly spaced? If annual flowers are planted too close together, they tend to crowd each other out and become leggy. They become susceptible to diseases because there is decreased air movement and a buildup of humidity and moisture around them. If they're spaced too far apart, there can be a problem with weeds and rapid soil moisture loss. In general, most annual plants should be spaced eight to ten inches apart. However, this is species dependent. Some plants, like the wax begonia, may need to be spaced closer, while plants such as the *Melampodium* should be planted approximately 18 inches on center.

13. Is the location of the flower planting appropriate? Flowers, in general, are labor intensive, and expensive elements of the landscape. Look at the location of the flower beds. Are you "getting the bang for your buck?" Are the flowers easily visible by a large number of people? Or are they in obscure places where very few people see them? Eliminate those beds that are not visible by a large number of people, or not visible by a select individuals. These areas may be planted with shrubs or turf grass.

Turf areas

14 Are strips of turf narrower than one and one-half times the width of your mower? When small strips of turf are common on your site, they require extra labor and equipment. Small turf areas create the need to use either trim mowers or line trimmers. Many of these areas requiring the use of either a trim mower or line trimmer can be eliminated by merging two beds together, or grouping trees into one large mulch bed.

15. Are there small, enclosed areas of turf on your campus? Small, enclosed turf areas also create problems and decrease the efficiency of your maintenance crew. They're very hard to mow, the mower in some cases may need to be lifted up over hedges or brought in through buildings. Many of these areas could be planted with alternative groundcovers that do not need to mowed on a weekly basis and only need to be trimmed once, or less, during the year.

16. Are there small areas of turf scattered throughout the site? Turf requires weekly mowing during the growing season. It also requires fertilization, weed control, watering and possibly insect and disease control. Maintaining a fine quality turf can be very expensive and the cost is escalated when there are small areas scattered throughout the site. Many of these areas can be planted with alternative plants, such as shrubbery or groundcover, which do not need weekly attention or the chemical applications necessary for turf. We have estimated the cost of maintaining 1,000 square feet of turf for 30 years costs approximately $25,000 while groundcover costs $5,000 and shrubbery costs $4,000.

17. Are steep, hard to mow slopes planted with turf? These areas are very maintenance intensive because they are difficult and time-consuming to mow as well as hard to establish a good quality turf. Steep slopes should be planted with an alternative groundcover that does not need to be mowed. When considering replanting steep slopes do not only look at the time involved in maintaining those slopes, but also the safety hazards. Are they dangerous to mow? One accident could lead to hundreds or thousands of dollars in worker's compensation, not to mention lost time of the injured employee.

18. Do bedlines have an excessive number of curves and are curved lines tighter than the radius of your mowers? Excessively and tightly curved bedlines increase mowing time. Just as the small strips of turf require different equipment for mowing, so do the curvilinear

bedlines. Also, consider the increased linear feet of edging that must be spaded or trimmed, that is created by these curved bedlines. Many times bed lines can be easily changed without effecting the design intent. Shrub and flower beds are most attractive and maintenance efficient when they have large, broad, sweeping curves.

19. Is turf continually damaged due to high traffic or high amounts of salt or poor growing conditions (like soil being too wet or too dry)? Continual renovation of turf is not cost-effective. The most cost-effective way of dealing with these areas is to select a plant or other material that will withstand the conditions of the site. Cobbles, or other types of pavement, may be excellent alternatives for high traffic areas. Shrubbery, perennials or other grasses that would tolerate the growing conditions should be planted in these areas. More than likely, the cost of this new treatment will be recovered in two to three years through the money and time saved by not renovating the existing turf.

20. Are there unnecessary objects in the lawn? Every object within the lawn area creates a need for line trimming—one more time consuming maintenance operation. Evaluate obstacles to find out if they are truly necessary. If they aren't necessary, eliminate them. If the obstacles are not removable, such as light posts, electrical boxes or utilities, there a some options: (1) they can be incorporated into pavement or planting beds, (2) a non-selective herbicide, like Roundup, can be used around these objects. When using Roundup, be aware of the aesthetic impact. There will be a ring of brown grass or vegetation around that object.

21. Are there edges on your site that are difficult to maneuver or mow around? Look for eroded edges around ponds, edges that are spaded too deep, and heaving steel or plastic edging. Placing a rip-rap border around the pond edge will help the erosion problem and also eliminate the need for mowing right up to the edge of the water. Edges that are spaded too deep can cause mowers to fall off the edge and scalp the turf. Heaving steel or plastic also causes problems for mowers. The mowers can hit these edges and damage the blades or the edging. Steel edging should be pounded back down with a mallet. Plastic edging should be removed. Eliminating these difficult to mow edges also eliminates the need for extra line trimming.

Signage

22. Is your signage readable from a distance? Are the letters large enough to be seen? Is the color appropriate, or does it blend into the background? Unreadable signage does not effect the efficiency of your maintenance program but it does effect the site's function as well as it's appearance.

23. Is your signage obstructed by plants? Plants that need to be pruned more frequently to keep them from hiding the signage adds to your maintenance load. Remove these plants and replace them with more suitable types. Framing signs with plants is one way to draw attention to them without hiding them.

24. Does the signage have a uniform appearance throughout the site? Again this is strictly an aesthetic landscape decision but uniform signage can enhance the image of your campus. Mix-matched signage can be distracting and create an inconsistent appearance and unprofessional image.

25. Does the signage color and material compliment the building styles? Signage color and style are very important to the overall character of the site. Signage can be one element that ties the whole site together. Very informal or contemporary signage is inappropriate with formal, historic buildings. Even if building styles are different throughout the campus, signage treatment that is complimentary to the building styles and complimentary to each other can unify the entire site's appearance.

26. Is the signage material appropriate? Is it able to withstand the weather? Signs that are in constant need of repair, whether it be painting or replacement, increase labor time and expenses.

EVALUATE ORGANIZATIONAL STRATEGIES

Take a look at how your staff and facilities are organized. Do not take the attitude that if its not broken it doesn't need to be fixed. Each of us can find ways to improve our operations. Possible alterations in your crew set up, staff responsibilities, maintenance facilities and your labor source may save your organization a significant amount of money. When evaluating your organizational strategies, ask these questions.

27. Does your staff perform tasks taking a team approach? It has been proven that a team of two or three people working together can finish tasks or a group of similar tasks in fewer man-hours than an individual. Many tasks can be done faster and easier when one staff member has help from another. Also, when working in groups, a quicker employee will set the pace for the other team members, speeding up completion time.

28. Do your teams complete one type of operation, i.e., mowing, throughout your campus or is each team responsible for all routine maintenance operations? For large campuses where there is extensive mowing and very little landscaped area, it is most productive to divide your staff into mowing crews and specialty crews. For small sites, or sites with extensive landscape plantings, it is most productive to divide your site into areas and assign one crew to be responsible for all routine maintenance in their area.

29. Are seasonal employees exposed to any tasks beyond mowing, pulling weeds or picking up trash? Georgetown University permitted seasonal employees to directly assist each crew leader and work on a variety of maintenance tasks. This strategy improved the University's ability to manage seasonals—the variety kept their interest, fewer mistakes were made and there was a higher rate of seasonals returning the next year. Another benefit was the added sense of responsibility given to the crew leaders for supervision and training of the seasonals.

30. Is your maintenance shop conveniently located for easy access to all parts of the campus? For a large campus, consider setting up storage facilities at various locations throughout the site. Indiana University, Bloomington, is divided into sections and there is a building for storage and a shop in each section. The crew responsible for that area reports to work, takes breaks and lunch at the facility in their area. This saves travel time and confusion when employees report to work and need to pick up equipment and materials.

31. Does your storage facility provide for organized, protected storage for all equipment and materials? Organized storage can be as important to productivity as an organized

maintenance program. Knowing exactly where to store and find equipment or materials saves hours of start up and clean up time. Also, by having storage available you can purchase materials in quantities or in bulk to save money. Protected storage also reduces losses—there will be fewer lost or broken pieces of equipment, dead plants, or contaminated fertilizer.

32. Is your in-house staff or contractor providing the most cost-effective service? To be sure you are paying a competitive price, you must do a cost comparison. If you are using an in-house staff, you may ask several local contractors to bid on complete maintenance of your site or specific services. If a contractor can provide similar service for less cost, it may be in your best interest to contract services. If you are using a contractor, it is wise to get bids every three years, to be sure you are getting the best price possible. Also, you may compare contractors fees to the cost of managing your own staff, and find in-house service to be more cost-effective.

EVALUATING EQUIPMENT

With today's technology and innovations in landscape maintenance equipment, many hours can be saved with the right tools and equipment. However, not every new invention works as well as the manufacturer's claim. In some cases, the most productive pieces of equipment are manufactured by the landscape maintenance staff to fit a specific need of their site. Whether new, old or a recent invention by your staff, the landscape maintenance equipment must be inventoried and evaluated. Below are common equipment problems that hinder maximum productivity and compromise quality.

33. Is your staff equipped with all of the tools necessary to complete their tasks in an efficient manner? If your staff is not properly equipped and tools need to be purchased and delivered or picked up, time is wasted. Also, time is wasted when alternate tools are used to complete a job. Many times, tasks are left incomplete because the necessary tools are not available. For large pieces of equipment that are not used regularly, consider a short-term lease or rental. Planning ahead is a must to ensure that the piece of equipment is available on the days that you need it. Form B lists tools and equipment necessary for a four-man crew to complete routine maintenance.

34. Is your staff using the right equipment for the job? Improved efficiency results from using quality, state-of-the-art tools and equipment, but maximum efficiency is gained only when the tools and equipment are used properly. For example, the largest, fastest mower is not going to be the most efficient piece of equipment to mow a one-acre parcel with many trees. Sharpened, by-pass hand pruners are the best tool for pruning small branches less than ¼ inch diameter, but if they are used to cut larger stems, the task will take longer and the quality of the cut will be marginal.

35. Do you use trailers to carry and store your maintenance equipment? Portable storage can save hundreds of hours each year by eliminating the load and unload time, and travel back to the shop for a forgotten piece of equipment. Trailers can be customized so that tools and equipment are also easier to keep track of and fewer are lost or broken.

36. Does your staff have efficient transportation around the site? On all sites, time can be saved by using some type of utility vehicle. Maximum efficiency will be achieved if that vehicle can accommodate all necessary tools and materials needed for a days work.

37. Do you maintain your tools and equipment daily? Downtime caused by broken equipment or tools can greatly decrease productivity. Preventative maintenance—routine grease and oil changes, cleaning equipment, sharpening or replacing blades, can eliminate costly break downs. All equipment, including irrigation system, trucks, chippers, trailers, chain saws, line trimmers, mowers and sprayers, must be checked routinely.

EVALUATE MAINTENANCE PROGRAM AND TECHNIQUES

Having a thoughtful, documented maintenance program can greatly improve efficiency and protect the landscape investment. Most inefficiencies occur when problems and situations are reacted to. By planning ahead and preparing for routine maintenance, many of the "emergencies" that arise during the year that hinder productivity can be eliminated. To evaluate your maintenance program and techniques begin with these areas.

38. Have you identified what tasks need to be done and why? Document each task your staff does and ask yourself why they are doing each specific task. What does it accomplish? Do not neglect important tasks while undertaking other tasks that often times compromise a site's appearance. To identify important operations, consider plant health before cosmetic appeal. In the long run, healthy plants are less costly to maintain and are generally most attractive.

39. Do you have a "calendar of operations" that outlines timing and frequency of each operation. A yearly schedule showing timing and frequency of all operations is an excellent planning and budget tool, as well as a key to daily or weekly scheduling. Using a format like Form C, similar tasks can be scheduled to be completed at the same time, and operations can be spaced throughout the year to avoid uneven work load from week to week. Special events can be highlighted and planned in advance.

40. Do you provide training for teaching proper technique for horticultural and cosmetic operations? Training is a must for maximum efficiency. Not everyone knows how to mow a lawn, change the oil in a mower or prune an ornamental. If you assume that they do, you will be managing for damage control instead of continual improvement of your site and operations.

41. Do you have a standard, written specification describing the appearance and execution of each task? Written specs describing the end result of a task, the equipment needed and where and when it should be done are excellent training tools and hold your staff or contractor accountable. If you are unsure of the proper horticultural technique, consult with a horticulturist on your staff or an outside consultant. You should be familiar with the proper techniques for mowing, edging, pruning, mulching, watering and planting. See Form D for a sample specification.

42. Do you have a trained horticulturist inspect the site routinely? Preventative maintenance for the living components of your landscape is as important as a PM for equipment and infrastructures. A trained horticulturist can troubleshoot problems and provide solutions before they get out of control.

Integrated Pest Management (IPM) is rapidly replacing the once common applications of broad-spectrum insecticides and herbicides. IPM involves monitoring pest populations, weather

and other environmental conditions. Using IPM, a horticulturist would recommend treatments only when the conditions reveal economic damage, if plant material is left uncontrolled. Also, IPM involves the use of the least toxic, most effective control for the specific problem. Horticultural oil, soaps and biological controls are now widely used.

EVALUATE MANAGEMENT TOOLS

Your responsibilities as director or manager for a university or college are likely to be broadened in the near future, if they haven't already. New responsibilities leave you with less time to devote to each area. Often times, with new responsibilities comes a lack of experience and knowledge of the new job. The following management tools along with the pruning guidelines, calendar of operations and specifications can improve your ability to manage the landscape, to run the most cost-effective, horticulturally- and environmentally-correct operation.

43. Do you have a set of updated landscape plans? Updated landscape plans, along with computerized plant inventories can improve management efficiency by enabling you to know exactly what you are managing without leaving your office. Updated landscape plans are excellent communication and planning tools. Reduced copies can be given to contractors or staff working in the area with specifics of the work assignment highlighted. A computerized inventory makes viewing, storing, retrieving, sorting and updating information quick. With today's technology, graphics and data are easily integrated. Other useful documents include as-built plans for irrigation, utilities, lighting, pavement and site furniture.

44. Do you track your labor usage? How will you know how much time is actually used for various tasks if you do not track labor? This tracking sets up base line data to justify labor, set and compare new goals, compare your staff to contracted services and plan maintenance for newly acquired property.

45. Do your work orders include the time allotted to complete the assigned work? Productivity can be improved by setting goals for every task. By nature, most people are competitive and will try to reach or achieve a goal. When setting time goals, don't rely on past performance alone. Use past performance as a starting point and look for ways to save time. In many cases your time goals may be up to 30 percent less than your historic record. These new goals can be reached if it is clearly communicated. Let your staff help set these goals. They'll be more committed to goals they set.

46. Do you accept proposals from contractors or solicit bids? The only way to get truly competitive bids is to prepare a bid package outlining exactly what services you need and ask contractors for a price. Asking them for a proposal will result in recommendations ranging from A to Z. Who do you choose? How do you know if their prices are fair for the work they propose?

A bid package should include appearance and performance specifications, general contract conditions, a line item format for bid submittal, easy "apples to apples" comparison and invoicing specifications for monitoring contract compliance. A complete, detailed bid package will make selecting, negotiating with and monitoring a contractor more efficient.

47. Does your contract give you the right to: terminate the contract with 30 days notice, withhold payment for work not completed or unsatisfactory work, the right to

extend the contract for two to three years with a maximum set fee increase? Adding these clauses to your contracts can give you the flexibility and power you need to effectively manage and protect your landscape investment. Check with your legal advisors for proper contract language.

48. Does your annual budget include a line item price for each operation? Listing exactly what needs to be done and how much it will cost, including labor and materials, makes a budget justifiable. Don't forget to include indirect time and materials in your budget. Indirect operations include equipment maintenance, training, clean up, travel, etc.

49. Can your staff provide services for neighboring properties to generate income for your operations? If there is a neighboring hospital, medical center, professional offices and/or private research and development facilities, your staff may be able to provide maintenance services and generate income to supplement your budget. If you are already providing services for other departments or affiliated organizations, consider charging them for your services.

50. Do you use a computer for any aspect of landscape management? Word processing, database, spreadsheets and graphic programs can all improve your ability to successfully manage your landscape. A computer can efficiently store, sort, retrieve, update and print all types of information. Labor tracking, work order generation, site documentation and equipment inventories can be improved with the use of a computer. The possibilities are endless.

CONCLUSION

Evaluate your campus landscape and maintenance operations today. It's easy if you begin with the 50-point inspection. Prioritize improvements and start making changes. You'll see that there are literally hundreds of small changes that can be made for large paybacks in improved productivity, dollars and campus appearance.

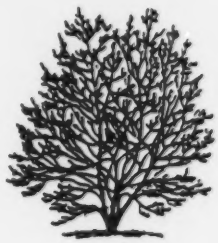
Landscape Maintenance
Appearance and Performance Specifications

5.04 Deciduous Shrubs

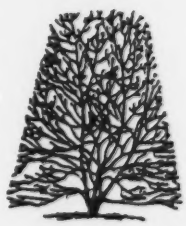
Appearance

- All deciduous shrubs on site shall be pruned to create the appearance specified by the design intent or site manager. They can be either:

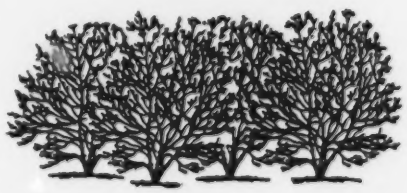
A. Open, natural appearance:
Maintain the natural branching structure of the shrub, pruning only to promote healthy, natural development.



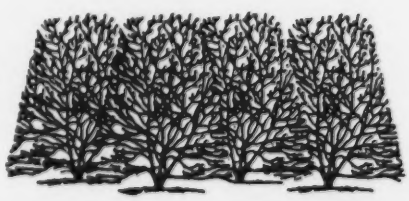
B. Sheared appearance:
Remove all irregular branching to create an even, uniform edge to the outermost tips of the branches.



C. Massed grouping:
Whether a sheared or natural massing, allow plants to grow together with branches touching. As shrubs mature they should not look like indvidual plants.



D. Hedge:
Whether sheared and formal or natural and informal, plants in a hedge shall grow together with branches touching. Sides of the hedge shall be tapered with lower branches longer than branches on the upper portions of the plants.



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Maintenance Equipment for a Four-Man Crew

Form B

Use this checklist as a guideline to make sure your crews are properly equipped. We have found that every four-man crew should have the following complement of equipment and tools to be most efficient.

Note: Your site may require additional specialty equipment or tools, depending on its size and complexity.

# OF PCS.	EQUIPMENT	IN CURRENT INVENTORY	TO PURCHASE
3	21" trim mowers		
1	48" intermediate mower		
1	36" intermediate mower		
2	backpack blowers		
4	backpack sprayers • fungicide • insecticide • selective broadleaf weed control • non-selective broadleaf weed control		
2	line trimmers		
2	sidewalk edgers		
1	giant vacuum		
1	18" chain saw		

# OF PCS.	TOOLS	IN CURRENT INVENTORY	TO PURCHASE
4	long handle, round point shovels		
4	nursery spades		
1	scoop shovel		
4	spring-back leaf rakes		
1	utility broon		
2	spading forks		
4	four-tine cultivators		
1	manure fork		
1	8-lb. sledge hammer		
2	curved pruning saws		
1	pole pruning saw		
4	hand trowels		
4	hand pruners		
6	root feeders • 150 ft. of ¼" hose		
2	2-way shutoff "Y's"		
2	turnkeys (4-way)		
24	8' x 8' leaf tarps		
1	water cooler		
2	5 gal. gas cans (unleaded)		
2	2 gal. gas cans (leaded)		

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Maintenance Equipment for a Four-Man Crew

Form B

# OF PCS.	TOOLS (continued)	IN CURRENT INVENTORY	TO PURCHASE
1	wheelbarrow		
1	first aid kit		
1	reflector kit		
1	set of jumper cables		
1	flashlight		
1	jack stand		
1	tire iron		

# OF PCS.	TOOL BOX	IN CURRENT INVENTORY	TO PURCHASE
1	metric socket set		
1	standard socket set		
1	12" mill bastard file		
1	8" adjustable pliers		
1	8" adjustable wrench		
1	10" adjustable wrench		
1	set of six (6) screwdrivers • flat point • Phillips		
1	utility knife		
1	line level		
1	needle nose pliers		
1	hacksaw		
4	putty knives		
3	pronge adapters		
1	vise grips		
1	mason line		
1	100' tape		
1	roll electrical tape		
4	pair safety glasses		
1	box disposable respirator masks		
1	cartridge respirator		
1	cleaning brush		
1	channel locks		
1	50' extension cord		

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CALENDAR OF OPERATIONS:

Landscape Maintenance

Form C

NO.	DESCRIPTION OF FUNCTIONS	NUMBER OF OCCASIONS	APRIL 1ST WEEK	APRIL 2ND WEEK	APRIL 3RD WEEK	APRIL 4TH WEEK	APRIL 5TH WEEK*	MAY 1ST WEEK	MAY 2ND WEEK	MAY 3RD WEEK	MAY 4TH WEEK	MAY 5TH WEEK*	JUNE 1ST WEEK	JUNE 2ND WEEK	JUNE 3RD WEEK	JUNE 4TH WEEK	JUNE 5TH WEEK*	JULY 1ST WEEK	JULY 2ND WEEK	JULY 3RD WEEK	JULY 4TH WEEK	JULY 5TH WEEK*	AUGUST 1ST WEEK	AUGUST 2ND WEEK	AUGUST 3RD WEEK	AUGUST 4TH WEEK	AUGUST 5TH WEEK*	SEPTEMBER 1ST WEEK	SEPTEMBER 2ND WEEK	SEPTEMBER 3RD WEEK	SEPTEMBER 4TH WEEK	SEPTEMBER 5TH WEEK*	OCTOBER 1ST WEEK	OCTOBER 2ND WEEK	OCTOBER 3RD WEEK	OCTOBER 4TH WEEK	OCTOBER 5TH WEEK*	NOVEMBER 1ST WEEK	NOVEMBER 2ND WEEK	NOVEMBER 3RD WEEK	NOVEMBER 4TH WEEK	NOVEMBER 5TH WEEK*
1.00	MOWING OPERATIONS																																										
1.01	GENERAL MOWING	30																																									
1.02	LINE TRIMMING	30																																									
1.03	REMOVAL OF CLIPPINGS	30																																									
2.00	EDGING OPERATIONS																																										
2.01	SIDEWALKS	8																																									
2.02	CURBS	8																																									
2.03	SHRUB AND FLOWER BEDS	8																																									
2.04	TREE RINGS	8																																									
3.00	WEEDING AND CULTIVATION																																										
3.01	MANUAL WEEDING	8																																									
3.02	SOIL CULTIVATION	2																																									
3.03	MULCH CULTIVATION																																										
4.00	FERTILIZATION & CHEMICALS																																										
4.01	TURF FERTILIZATION	3																																									
4.02	PRE-EMERG. CRABGRASS CONT.	1																																									
4.03	POST-EMERG. CRABGRASS CONT.																																										
4.04	BROADLEAF HERBICIDE	2																																									
4.05	TURF SPOT WEED CONTROL	1																																									
4.06	TURF INSPECTIONS																																										
4.07	BED PRE-EMERG. WEED CONT.	2																																									
4.08	BED POST-EMERG. WEED CONT.	2																																									
4.09	TREE FERTILIZATION	1																																									
4.10	SHRUB FERTILIZATION	1																																									
4.11	GROUNDCOVER FERTILIZATION	1																																									
4.12	ANNUAL, PERENNIAL & ROSE FERT.	3																																									
4.13	PLANT INSPECTIONS	3																																									
4.14	DORMANT OIL	1																																									
5.00	PRUNING OPERATIONS																																										
5.01	SHADE TREES	1																																									
5.02	EVERGREEN TREES	1																																									
5.03	ORNAMENTAL TREES	1																																									
5.04	DECIDUOUS SHRUBS	2																																									
5.05	EVERGREEN SHRUBS	2																																									
5.06	GROUNDCOVER	3																																									
5.07	REJUVENATION	1																																									
5.08	RENOVATION	1																																									
6.00	CLEAN UP PROCEDURES																																										
6.01	POLICE FOR DEBRIS	35																																									
6.02	SPRING AND FALL CLEAN UP	3																																									
6.03	WALKS AND CURBS	35																																									
7.00	TURF RENOVATION																																										
7.01	DETHATCHING																																										
7.02	CORE AERATION	1																																									
7.03	TOPDRESSING & OVERSEEDING																																										
7.04	SLIT SEEDING																																										
8.00	GENERAL WATERING GUIDELINES																																										
8.01	WATERING ESTABLISHED TURF	22																																									
8.02	WATERING NEW SOD																																										
8.03	WATERING NEW GRASS SEED																																										
8.04	TREE, SHRUB & GROUNDCOVER	11																																									
8.05	ANNUAL/PERENNIAL WATERING	22																																									
9.00	MISCELLANEOUS ITEMS																																										
9.01	ROUTINE SOIL TESTING	11																																									
9.02	FLOWER AND PERENNIAL MAINT.	26																																									
9.03	SITE INSPECTION WITH REPORT																																										

* = Include 5th week only when applicable.

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Landscape Maintenance
Appearance and Performance Specifications

4.06 Inspection of Turf for Insects and Diseases

Appearance

- All turf on site will be kept free from insects or diseases that will cause irreversible damage to the turf.

Performance

- A horticulturist shall conduct a general inspection of the turf for presence of insects and diseases.
- When insects or diseases become evident, the horticulturist shall notify the site manager and the maintenance supervisor of the insect or disease present and recommend the appropriate follow up procedures.

4.07 Shrub Bed and Tree Ring Pre-emergent Weed Control

Appearance

- All shrub beds and tree rings shall be free from weeds.

Performance

- A pre-emergent, broad-spectrum herbicide shall be applied to all shrub beds and tree rings.
- Weeds not controlled by the pre-emergent shall be manually or mechanically removed or controlled by a post emergent type herbicide.
- Maintenance staff shall take proper precautions when applying herbicide around plants that are listed as sensitive on the product label.

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Thermal Energy Storage: A State-of-the-Art Approach to an Ancient Technology

John E. Haley
Associate Director, Facilities Management
Indiana State University

General Description and History of Thermal Energy Storage

The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) HVAC systems and applications handbook defines Thermal Energy Storage as "the temporary storage of high or low temperature energy for later use. It bridges the time gap between energy availability and energy use". In other words, Thermal Energy Storage is a technology which allows heating or cooling energy to be produced at a time when that energy is either more readily available or less expensive and kept until it is needed.

A Thermal Energy Storage system therefore requires the means to perform three primary functions. The first function is the production of heating or cooling energy. Secondly, a means of adequately storing that energy until it is needed must be provided. Finally, provisions must be made to recover the stored energy in a useful form.

Thermal Energy Storage is not a new concept. History records the use of Thermal Energy Storage as early as the ancient Pharaohs of Egypt. At the end of the day, slaves would take large stones out into the desert. The cooling night air of the desert would cool the stones. Early in the morning, the slaves would return the stones to their masters homes. These stones would slowly release the cooling energy which had been stored in them to assist in keeping the house cool during the heat of the day.

In the early days of our country, and in many cases up until the days of our grandparents and parents, Thermal Energy Storage was used as a means for keeping warm at night. Stones or bricks were heated around the fire. The stones or bricks were then wrapped in blankets or towels and taken to bed to slowly release their heat during the night, keeping the occupants of the bed warm.

In the 1940's and 1950's Thermal Storage systems saw a rise in popularity in the dairy industry. Products were brought to the plants early in the morning and needed to be cooled quickly. Compared to the cooling required for this process, very little cooling was required for the remainder of the day. This presented the perfect opportunity for the use of an Ice Thermal Storage system. An ice storage system allowed equipment (including electrical services) to be downsized dramatically. The equipment could be sized to manufacture enough ice in a 22 hour period to cool the product rather than sized to cool the entire product in a 1-2 hour period. This would allow a 100 ton machine to do the work otherwise required of a 2000 ton machine.

As we moved into the 1980's and 90's, a new reason for Thermal Energy Storage systems came about: the cost of electricity. Do not misunderstand this statement. A Thermal Energy Storage system does <u>not</u> conserve energy, it conserves <u>dollars</u>. A Thermal Energy Storage system allows for the production of energy at "non-peak" times when energy may be purchased at a lower price. Many electric utility companies now are required to build "peaking plants" to provide the large electric demand during the hottest days of the Summer. They have more than enough capacity to meet their demand at all other times. These plants are very expensive to only be used for a few afternoons each year. To battle this,many utilities are establishing rate structures which allow for the purchase of electricity at night and other non-peak times at a substantially reduced rate. These rate structures are aimed at those customers willing to utilize Thermal Energy Storage systems. The energy required to produce storable thermal energy is normally more than that required by a standard system because the equipment will be operating at other than it's most efficient temperature ranges. Even with the increased energy usage, the cost per unit of energy used is so greatly reduced that it is a much more cost effective system to operate.

<u>Thermal Energy Storage at Indiana State University</u>

Indiana State University is a 12,000 student Class 1 Doctoral

level state supported university. We have 2000 faculty and staff members. Our campus is comprised of 2.6 million gross square feet of academic and auxiliary services buildings and a total of 4.8 million gross square feet including Residential Life areas on approximately 200 acres of urban property.

Why would a university like Indiana State want a Thermal Energy Storage Chilled Water Plant? The easiest answer to that question is that we didn't ..... not exactly. We wanted a Central Chilled Water Plant and in the design of that plant, found a Thermal Storage Plant was a cost effective type of plant to purchase. Like many campuses around the country, we had a large variety of cooling equipment within our buildings, some dating back to the early 1950's. It has been known for years that a Central Chilled Water Plant would be beneficial to the operation of our university. The problem was that no one wanted to fund a utility plant when so much was needed on the campus in the way of remodeling existing buildings and construction of new buildings that people actually occupied. It has always been easier to get money for a classroom building or a gymnasium than to get money for "infrastructure".

In the Fall of 1989 we felt that if we were ever going to be able to justify a Central Chilled Water Plant, it had to be now. We were in the midst of a 10 year building and remodeling master plan and felt we would be able to take advantage of some of the equipment purchasing and replacement costs. We calculated that a 5000 ton Central Chilled Water Plant would be capable of cooling a total of 22 Academic Buildings on our campus. We also determined that the cost of this project should be about $6,000,000.

Because of the difficulty in getting projects funded through the Indiana State Legislature in times of economic downturn, we felt this project must be self justifying. We therefore set about determining what costs could be saved by the university if this Central Chilled Water Plant were to be constructed. Many of our existing chillers were inefficient steam absorption chillers and that allowed us to take advantage of steam production costs which would be eliminated. We had several service contracts we would be able to eliminate. We had many man hours of our labor that was used to keep these old machines operational. Several of the older chillers had far outlived their useful life and would have to be replaced within the next 3-5 years; and we took advantage of the anticipated replacement costs of those units. We took advantage of the reduced costs of buildings identified in our master plan as being constructed within the next five years by eliminating the

need for chillers and cooling towers. Savings in makeup water and chemical treatment for our condenser water systems by installing state-of-the-art water treatment systems was used. When the final total was ascertained, the simple payback for this proposed Central Chilled Water Plant was under four years.

When our Business Office looked at our figures, they disallowed many of the dollars we indicated would be saved. We could not count replacement costs of old machines. Although the machines may have been over thirty years old and in constant need of major repairs, we have been able to keep those machines running until now and we may be able to keep them running for several more years (according to the Business Office). We could not count man hour savings (other than overtime) unless we were going to layoff employees. We also could not take credit for reduced costs on new buildings because those may not be built. Their elimination of these left us with energy savings, repair parts savings, savings associated with deleting service contracts and water treatment savings. The savings we calculated we could realize from just these items were equal to ten percent of the estimated construction cost of the plant. This equates to a simple payback period of 10 years. Our Business Office felt this was a sufficiently short enough, simple payback period to allow for the issuance of bonds for the construction of the Central Chilled Water Plant and utilize the projected savings to pay off the bonds.

At this point we issued Requests for Proposal from Engineering Consultants who might wish to design the Plant for us while our Business Office prepared to submit to the Legislature for approval. We felt it important to select a firm within the same geographic area because of the short design and construction time we desired and the control we wanted over the project. R.E. Dimond and Associates of Indianapolis is the firm we selected. The contract with Dimond was signed in June 1990.

While we had previously completed a in-house feasibility study and were able to justify a Central Chilled Water Plant, the first charge to our consultants was to determine the most feasible type of plant for Indiana State University. Steam absorption, high efficiency electric, water thermal storage and ice thermal storage were the types of plants studied. Steam absorption was the most expensive to operate, and more expensive to construct than the electric plants. A standard chilled water plant design using high efficiency chillers was the least expensive to construct but operating costs were higher than that of both the water and ice storage plants. The water storage plant was approximately the same

cost to construct as the ice storage plant and slightly less expensive to operate. We found two major problems with a water thermal storage system. We were connecting a fifteen story building to the system and could not do that without utilizing a heat exchanger in the loop which starts decreasing the systems efficiency. The second problem, and the one we felt least comfortable with, was that a water storage system needs a chilled water loop temperature difference of 14-16 degrees Fahrenheit. With all of our existing buildings previously designed with an 8-10 degrees Fahrenheit temperature difference, we did not feel we could get a 14-16 degree Fahrenheit temperature difference on the loop. While the most expensive to construct, the cost difference between an Ice thermal storage plant and one of standard configuration could be paid for in 3-4 years of energy cost savings. This payback period was further decreased by a grant from Public Service Indiana (our electric utility company) of $150,000. They did this because a thermal energy storage facility would assist them in their efforts of peak shaving.

As mentioned earlier we were on a tight time line to complete the project. We had two years from the time we signed contracts with our consultant until a new Central Administration (University President and Vice Presidential Offices)and Central Computing Complex would be complete and occupied. This building was being built without a chiller, anticipating the advent of the Central Chilled Water Plant. In an effort to accelerate the design process, the plant location was selected and the underground piping to the buildings was being designed while the feasibility study was on-going.

Construction Documents were issued for bids April 8, 1991. Our goal was to release the plans to the contractors in early April in order to begin construction in mid May and to have a functioning project March 1, 1991. Unfortunately our State Legislature had problems resolving many items in 1991 and financial approval of the project did not occur until much later than early May. We finally signed contracts in July, 1991. At that time, we left the completion date of the project at March 1, 1992 knowing that less than eight months was an impossible task for a project of this magnitude. Our hope was that if we pushed for a March 1st completion, we would be operating in mid to late April. As it turned out, we started the first chiller on April 8, 1992.

Our Central Chilled Water Plant utilizes two cooling loops connected by plate and frame heat exchangers. The primary loop is filled with a water solution containing 25 percent ethylene glycol.

This loop is used for making and harvesting the ice. There are two electric centrifugal chillers rated at 1060 tons each at 38 degrees Fahrenheit leaving chilled water temperature and two ice storage banks rated at 980 tons each at peak discharge with a total storage capacity of 7875 ton hours each. The secondary loop is a straight water loop which connects to our buildings. Connected directly to this loop at our plant is a chiller rated at 1200 tons at 43 degrees Fahrenheit leaving water temperature. The total peak capacity of the plant is 5280 tons with 43 degrees Fahrenheit chilled water leaving the plant.

We attempted to look at every feasible means available to make the plant energy efficient and flexible. We have variable frequency inverters on the pumps to allow us to vary the water flow through the chilled water, glycol water and condenser water loops. We have the means to vary the water temperature on all three loops as well. We have valved the system to allow for water flows to be diverted in many different ways to vary the flow schematics as they best fit the actual operating conditions. We have also fully automated the plant to allow complete temperature and flow monitoring and control for my operators and me from remote locations.

We currently have 13 Academic Buildings connected to the plant. The calculated peak load of these buildings is approximately 3000 tons. We have the current capacity in the plant to add an additional 9 buildings increasing the peak load seen buy the plant by approximately 2000 tons with no additional work required at the plant. We have the physical space at the plant, electrical capacity at the plant and underground chilled water mains to increase the plant capacity by an additional 3200 tons by adding chillers, pumps and ice storage tanks. This would bring the total plant capacity to over 8000 tons. Current projection indicates this will be enough capacity for our campus for the next 25 years.

Central Chilled Water Plant Expansions and the CFC Refrigerant Issue

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Abstract

Case studies of several campus chilled water storage systems are described. Typical projects occur during central chilled water plant capacity additions or replacements. Storage compatibility with CFC, non-CFC, and absorption chillers is demonstrated, as is the potential to meet cooling load growth without the need to add or modify chillers. Storage is shown to provide opportunities for capital savings, as well as for O&M savings, versus equivalent conventional (non-storage) systems. Dual-service applications (for thermal storage and for fire protection per NFPA and Factory Mutual) are also described.

In addition, system operation and maintenance are briefly discussed. Physical sizing criteria are presented. And the pros and cons of above-ground versus below-ground storage and of steel versus concrete construction are described.

Background: Conventional Central Chilled Water Plants and the CFC Issue

Centralized chilled water systems are in common use to meet the air conditioning needs of colleges, universities, and other large campuses or district cooling facilities. Data from APPA (the Association of Higher Education Facilities Officers) indicate that over half its members operate central cooling plants.

Various configurations are in use, including single or multiple central chilling plants serving a single distribution system, non-connected miniature central systems, or combinations of one central and one or more satellite plants on a single distribution loop. Central plant chillers may be electric motor-driven centrifugal compressors, gas engine-driven centrifugal compressors, steam turbine-driven centrifugal compressors, heat-driven absorption chillers, or combinations of these types. The usual refrigerants are chlorofluorocarbons (CFCs); but alternatives such as HCFCs, HFCs, ammonia (NH_3), or absorption solutions may also be employed. "Free cooling" via cooling towers is sometimes used, directly or indirectly, during periods of relatively low ambient air temperatures.

It is often necessary that campus central plant capacity be increased or upgraded. Some of the common reasons for this are:

- construction of a new campus,
- expansion of an existing campus,
- centralization of a distributed cooling system,
- addition of a new building onto a cooling loop,
- increase of cooling loads at existing buildings,
- replacement of aging chiller equipment,
- conversion of chiller or fuel types,
- desire for efficiency improvements, and of ever increasing importance
- phase-out or replacement of CFCs.

During any central plant capacity expansion, O&M, capital, and life cycle costs are among the major concerns, as are the increasingly critical issues of reliability, flexibility, safety, and the environment. Specifically, atmospheric ozone depletion and the CFC refrigerant issue are now impacting everyone involved in the air conditioning field. Anyone selecting or planning for new chiller capacity is faced with choosing from options including CFCs, HCFCs, HFCs, ammonia, and absorption refrigeration. Each of the choices have unique and serious drawbacks:

- CFC production is banned, effective in 2000 (possibly in 1996).
- HCFC production is banned, effective in 2020 (possibly in 2005).
- HFC equipment is even less developed than most HCFC equipment.
- Ammonia is highly toxic and hazardous, requiring special precautions.
- Absorption equipment is costly to buy and unfamiliar to many O&M personnel.

Modifications of existing CFC equipment for HCFC or HFC use is not only costly but also projected to result in losses of capacity, typically reported at up to 10%. However, an alternative approach is now experiencing increased application.

The Chilled Water Storage Option

Thermal energy storage (TES), specifically when accomplished through the use of chilled water storage, is a technology with many benefits for campuses requiring CFC phase-out or capacity expansions of their central chilled water plants. Storage is located at the central plant or remotely along the distribution loop. Connected to both the supply and return headers, the mass of water in storage provides thermal capacitance for the chilled water system. During periods of peak cooling loads, cold water from storage is used to supplement (or replace) chiller operation; warm water from the loads is returned to storage simultaneously. During non-peak periods (typically nighttime or weekends), warm water is removed from storage, cooled by the chiller plant (or via "free cooling"), and returned to storage.

Installations dating back to the early 1980's often configured the chilled water storage in dual or multiple tanks employing the "empty tank method" to separate the supply and return water. The stored supply and return water volumes never occupied the same tank at the same time. This eliminated any chance of mixing, but added volume, complexity, and cost to the system. Other early systems employed single tanks with internal membranes or diaphragms to separate the supply and return water; this also added cost, and often maintenance problems.

Research and development efforts were conducted throughout the 1980's by the electric utility industry, academia, and independently by Chicago Bridge & Iron Company (CBI). This led to a proven means for storing supply and return water volumes together in a single tank, with separation being maintained via thermal stratification. Based on its superior performance and economics, thermal stratification has become the standard approach for chilled water storage.

Chilled water storage is compatible with whatever chiller technology is currently in use at central plants, and by its nature, equally compatible with whatever water chilling technology may become the choice in the 21st century. Installations are already in use being recharged by an array of technologies including electric motor-driven centrifugal compressors, steam turbine-driven centrifugal compressors, and steam-driven absorption chillers. Although chilled water storage is not the complete answer to the CFC issue, it can often be the option of choice for central plant operators throughout the 1990's. Cooling capacity growth can usually be met via the addition of storage, thus postponing the need to buy any new chillers for 5 or 10 years, or more.

Recent years have seen a rapid growth in the use of chilled water storage by colleges and universities in both the public and private sectors. Installations are either operating or in the immediate plans in virtually all parts of North America, including at more than two dozen colleges and universities in:

- Arizona
- California
- Colorado
- Connecticut
- Florida
- Iowa
- Michigan
- New Mexico
- New York
- Ohio
- Pennsylvania
- Texas
- Washington
- Ontario
- and Saskatchewan

In recent years CBI has designed and installed chilled water storage installations representing the equivalent of over 50,000 tons of peak chiller capacity and totaling more than 500,000 ton-hours of storage capacity. (One ton-hour equals 12,000 Btu's.). Data from some of these installations will be used for illustration in the sections which follow.

Physical Sizing Criteria for Storage

The required volume of storage is a function of several variables:

- Volume is proportional to the required thermal storage capacity.
- Volume is inversely proportional to the chilled water supply-to-return temperature difference (ΔT).
- Volume is inversely proportional to the product of all volumetric and thermal efficiencies associated with storage.

Volumetric and thermal efficiencies should consider as a minimum: external heat gain, internal heat transfer, internal mass transfer (mixing), and unusable volumes due to the thermocline (temperature gradient) zone, the inlet/outlet zones, the operating water depth range, and the minimum air space (at times significant, e.g. when sized for a seismic, sloshing wave). After allowing for these factors, an approximate rule-of-thumb for gross storage tank volume for typical CBI Strata-Therm™ stratified chilled water storage installations is:

$$\text{Volume (in gallons)} = \frac{\text{Capacity (in ton-hours)} \times 1{,}800}{\Delta T \text{ (in } ^\circ F)}$$

This formula is appropriate for typical tank heights (32 to 48 feet). However, many variables affect the final volume and the optimum choice of height and diameter; therefore an experienced designer or supplier should be consulted regarding the optimal size for each situation.

Similarly, care should be taken to optimize the required thermal storage capacity. It is a function of many factors, including: cooling load profile, electric rate structure, electric load profile, available chiller capacity, expansion plans, and local electric utility cash incentives (if any).

Design and Operation Issues

Chilled water storage systems should be designed to accommodate various operating modes, including:

1. Full storage (load shifting) - discharging storage to meet cooling loads without any concurrent chiller operation.

2. Partial storage (load leveling) - discharging storage to meet cooling loads with concurrent operation of at least some chillers (in parallel with storage).

3. Full recharge - recharging storage via chiller operation.

4. Partial recharge - recharging storage via chiller operation while simultaneously providing cooling to the loads from the chillers.

5. Standby - no circulation through storage, allowing the chillers to serve the cooling loads as they would in the absence of storage.

Where possible, the free water surface at the top of storage should be the high point of the chilled water distribution loop; this will permit the simplest system, hydraulically. However, wherever this is not practical to achieve, either of two alternatives should be considered:

- A plate-and-frame heat exchanger can be used to segregate the system into hydraulically independent loops, a high pressure distribution loop and a low pressure storage loop. The drawbacks of this approach include the added capital cost of the heat exchanger and additional pump(s) and control(s) and most significantly, the approach temperature at the heat exchanger which reduces the ΔT available in storage, thus increasing the necessary storage volume. A benefit is the segregation of the stored water, allowing greater flexibility in the choice of water treatment.

- A back-pressure sustaining valve can be used to maintain the required minimum positive pressure throughout the distribution loop. A booster pump is therefore required for reinjection of the water from storage back into the higher pressure distribution circuit. The drawbacks of this approach include the capital cost of the control valve(s) and pump(s) as well as the (usually moderate) parasitic operating cost of the booster pump. The benefit is that the ΔT and size of storage are unaffected.

It is not economically practical to design large chilled water tanks for any significant internal pressure beyond the hydrostatic pressure of the head of stored water.

Wherever possible, the chilled water system should be operated in a manner which maximizes the supply-to-return temperature difference (ΔT). This can most easily be accomplished through the use of variable flow chilled water pumping and two-way (rather than three-way) control valves at the cooling loads. Maximizing the ΔT will minimize storage volume and capital cost. The ΔT for typical storage installations ranges from below 10°F to over 20°F, but the higher, the better.

Maintenance Issues

Maintenance for a stratified chilled water storage system should always be less than for equivalent conventional chiller plant capacity. Although early methods of chilled water storage did involve maintenance-intensive components (e.g., the large membranes or diaphragms of membrane-separated storage or the large switching valves of "empty tank method" storage), stratified storage requires no moving parts.

Maintenance of the storage element is largely limited to periodic (long-term) cycles of repainting and reinsulating, and to water treatment. Properly installed systems can be expected to experience approximately 7 to 12 years between repainting and 15 to 25 years or more before reinsulating.

Water treatment requirements vary with each installation based on unique combinations of water chemistry and materials of construction within the distribution system. Water treatment is not required to protect Strata-Therm™ tanks, as the tanks themselves are lined with an AWWA (American Water Works Association) approved paint system, identical to that used for municipal, potable water storage tanks. Typical installations do involve an initial treatment of the storage volume for purposes of protecting the balance of the piping system from corrosion, biological growth, etc. Initial costs are usually in the range of one to several cents per gallon treated. On-going treatment costs for the chilled water system are generally unchanged by the addition of storage.

A program of regular monitoring, inspection, and remedial action (as necessary) is recommended to ensure long life. In any case, maintenance should be less than for the chiller and cooling tower capacity avoided by the use of storage.

Above-ground versus Below-ground Storage

Consideration is sometimes given to locating storage partially or fully below grade. This may be for aesthetic reasons, or to allow the on-going utilization of the location for other purposes, such as parking, an athletic field, or a green space. Placing storage below grade should be done only after considering various factors:

- system hydraulics (often complicated by a below-ground tank)
- design of the tank for external pressure (for instances when the tank is empty)
- soil and groundwater conditions (which impact design and cost)
- regulations regarding buried tanks (which are increasingly restrictive)
- choice of water treatment (which may be limited, if the tank is buried)
- total capital cost (often double that of an above-ground tank)

As an example, a 54,000 ton-hour, 5.5 million gallon chilled water storage system was recently installed at Arizona State University in Tempe. This direct-buried storage facility, which of necessity was located beneath an athletic field, incurred an installed cost of $5.1 million. At about the same time, a 68,000 ton-hour, 6.1 million gallon Strata-Therm™ installation for Chrysler's new R&D campus was completed outside Detroit, MI. The above-ground Strata-Therm™ installation was completed for only $2.6 million.

If the top of storage must be kept low, a technically and economically viable alternative may be to build an above-ground tank within an excavated depression. This was done for the 13,000 ton-hour Strata-Therm™ installation for the Los Angeles Department of Water and Power at its new office complex in Sun Valley, CA.

Steel versus Concrete Construction

Neither concrete nor steel tanks are maintenance free. However, lower initial costs and lower life cycle costs for steel construction have led to the dominance of steel tanks throughout the range of water storage applications, whether for municipal, fire protection, or chilled water storage. Some steel water storage tanks have been documented to achieve more than 100 years of continuous service.

Concrete water storage tanks are typically specified, designed, and constructed in accordance with AWWA standard D-110. However, even this standard permits leakage rates of up to one tenth of one percent of the tank capacity per day. For a three million gallon tank, this equates to over a million gallons of leakage per year! Welded-steel Strata-Therm™ tanks by contrast are designed, installed, and tested in accordance with AWWA standard D-100 which does not permit any leakage.

Thin-walled steel tanks also offer a performance advantage over thick-walled concrete tanks. The thermal capacitance of the tank wall must be alternately cooled and reheated (across the operating ΔT) during each cycle of the chilled water storage system. This represents an inherent storage inefficiency which is roughly an order of magnitude larger for the more massive concrete tanks.

Aesthetic Considerations and Architectural Options

Aesthetics is often an issue for chilled water storage, particularly for college and university campuses.

In some cases, even large multi-million gallon storage tanks can be effectively hidden from public view through careful placement behind central plant buildings or trees. Where tanks cannot be hidden from view, it is possible to choose a tank shape and an insulation finish either to blend with or complement the surrounding architecture or to make their own visual statement.

Conventional choices include various roof styles (cone, dome, ellipsoidal, etc.) and various insulation types (urethane foam without a rigid jacket, foam panels with horizontally strapped aluminum jacketing, or foam panels with vertically ribbed aluminum jacketing). Various paint colors are available, as are custom paint schemes such as the school name and football team mascot and nickname employed on the 5,000 ton-hour Strata-Therm™ installation for the North Mesquite High School "Stallions" in Mesquite, TX.

Strata-Therm™ tanks are also available with the Fascia-Therm™ finish, a synthetic stucco insulation system which permits custom combinations for color, texture, and 3-dimensional relief to achieve virtually any desired architectural style. CBI has also built many one of a kind tanks such as the carillon (bell tower) tank on the campus of the State University of New York at Albany and the one million gallon "Peachoid" in Gaffney, SC.

Dual-use Installations for Cool Storage and Fire Protection

Approximately 30% of Strata-Therm™ installations are designed for dual-service applications where, in addition to thermal storage, they provide fire protection water storage. This is possible because of two characteristics:

- Thermally stratified chilled water storage tanks operate full at all times, with all the water available for fire protection if needed.

- When used for fire protection, Strata-Therm™ tanks are designed, constructed, and tested in accordance with the National Fire Protection Association standard NFPA 22, "Water Tanks for Private Fire Protection".

In addition, chilled water storage for dual-service thermal/fire protection applications can be provided with Factory Mutual approval as was obtained for the 8,500 ton-hour Strata-Therm™ installation at the Phoenix Newspaper's new printing facility in Phoenix, AZ.

Operation and Maintenance Savings

The use of chilled water storage as thermal capacitance within a central chilled water distribution system provides various O&M benefits. By decoupling the chillers from the time-varied cooling load profile, chillers can be operated at full or optimum capacity levels, avoiding inefficient, severe part-load conditions. Increased nighttime use of chillers also results in efficiency improvements due to the lower condensing temperatures. On the maintenance side, less total chiller capacity is required, thus reducing the size or quantity of installed chillers, cooling towers, and condenser pumps and fans, and yielding a reduction in equipment maintenance costs.

However, the greatest importance for O&M costs is, in the case of electric motor-driven chillers, the significant reduction in the campus' peak electric demand charges and the shifting of electrical energy consumption from high cost on-peak periods to low cost off-peak periods at night. It is common to achieve simple paybacks on investment of 1 to 2 years, or better.

The Austin (Texas) Independent School District is now in its fourth year of operation of the 2,600 ton-hour Strata-Therm™ system at the 2,000 to 3,000 student James Bowie High School. After earning a $95,450 cash incentive from the City of Austin Electric Department, the school district achieved a simple payback of only 10 months based on a combination of operating and maintenance savings of over $25,000 per year.

In 1991, the Brazosport Community College in Lake Jackson, TX (a campus of 3,000 to 4,000 students) brought its 4,000 ton-hour Strata-Therm™ chilled water storage tank on-line. The system eliminated the need for 600 tons of new chiller capacity, earning a cash incentive of $152,200 from its electric utility, Houston Lighting & Power. Annual electric energy savings for the college were independently estimated to be $62,500 at current electric rates, and more in the future.

Recent Strata-Therm™ installations at the Sacramento campus of the California State University and at the Hershey Medical Center of the Pennsylvania State University provide 12,300 and 12,500 ton-hours of storage, respectively. The CSU - Sacramento system avoided the need for 2,500 tons of chillers and cooling towers, achieving a peak electric demand savings of 2,000 kW and earning approximately $400,000 of cash incentive from Pacific Gas & Electric. The medical center avoided 1,500 tons of chillers and cooling towers, for a demand reduction of roughly 1,200 kW and a cash incentive of $100,000 from Pennsylvania Power & Light.

The 68,000 ton-hour Strata-Therm™ system at Chrysler Motors Corporation's new Technology Development Center campus in Auburn Hills, MI represents a peak electric demand reduction of 5.3 megawatts. At current Detroit Edison electric rates, this equates to a demand savings alone of $74,000 per month or nearly one million dollars annually.

Capital Cost Savings

In the case of large chilled water storage installations, it is common to achieve not merely rapid paybacks but immediate capital cost savings, even without utility cash incentives. This is achieved (either for new construction or for retrofit capacity expansions or replacements) through the use of central chiller plants sized not for the peak load (plus spare capacity), but rather for the average load over a 24-hour peak design day (plus spare capacity). The dramatic economy of scale inherent to large tank construction results in installed tank costs which are less than the avoided cost of installed conventional chiller plant capacity.

In the mid-1980's, General Motors Corporation planned an expansion of their GMC Truck and Bus plant in Pontiac, MI, requiring an increase in their peak chiller plant capacity from 5,000 to 7,000 tons. GM chose to install a 17,000 ton-hour Strata-Therm™ system (2,000 tons x 8.5 hours) rather than a conventional 2,000 ton electric chiller addition or a 2,000 ton absorption chiller addition. The chilled water storage system is recharged without the need for any new chillers, simply using the otherwise unused nighttime capacity of the original 5,000 ton central plant. GM realized an immediate capital cost savings (versus the cost of an electric chiller capacity addition) of $196,000 or essentially $100 per ton installed, without any utility cash incentive.

Chrysler's 68,000 ton-hour system provided even greater savings. Through the addition of storage, their requirement for new central plant capacity was reduced from 17,700 tons to 11,400 tons. Chrysler realized an immediate capital cost savings of $3.6 million, again without any utility cash incentives.

Capital savings need not stop at the central plant. Storage can sometimes be advantageously located (as one might do with a satellite chiller plant) somewhere along the distribution loop remote from the central plant. In this manner, the chilled water pumping and pipeline capacity can be peak-shaved as well. Smaller pumps and piping can be installed initially, or for cases of retrofit growth of a distribution loop, the need to increase the diameter of existing piping can be avoided. And unlike a satellite chiller plant, a remote storage tank will not require additional O&M personnel.

Contracting for Performance

The chilled water water storage tank is a critical performance element of any air conditioning system of which it is a part. Not only is the thermal storage capacity critical, so too are the rates at which storage can be charged and discharged, the ambient heat gain into storage, the discharge temperatures which will be obtained from storage, and the pressure drop through storage.

It is common (and recommended) to procure storage through the use of a performance type specification, in the same manner commonly employed to procure a chiller, a cooling tower, or any other major mechanical equipment element of a central plant. Strata-Therm™ installations are provided to meet such requirements, including a guarantee of both leak tightness and thermal performance.

Increasingly, it is also possible to contract with various third parties who will design, finance, install, and operate a system. Various possible arrangements include shared savings, guaranteed savings, and lease/purchase contracts.

Summary and Conclusions

Chilled water storage is experiencing rapid growth in campus applications for large central chilled water systems. With or without utility cash incentives, storage can provide not only significant O&M savings, but even a low capital cost option versus conventional central plant capacity additions.

Chilled water storage offers an option for capacity additions without adding CFCs. It will allow many campuses to meet their immediate growth needs, while postponing new chiller acquisitions for 5 or 10 years, at which time new refrigerant and new equipment choices should be much clearer than at present. Storage will be by its nature compatible with whatever water chilling technology is chosen in the future.

The technology has evolved through the 1980's to the point where chilled water storage is available with various aesthetic options, with guarantees of leak-tightness, and with guarantees of thermal performance. The dozens of installations currently in operation are likely to be the predecessors of many, many more in the years to come.

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ENVIRONMENTAL ISSUES

Are You Prepared for the Race With EPA?

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This presentation for small school administrators will provide information that will help colleges comply with EPA regulations as they pertain to PCBs. We will discuss the laws which exist including: equipment covered; dates the regulations took affect; dates for action; how to find and read the Federal Register; and other information gathering techniques. A discussion of the physical spaces involved and how you should prepare. We will examine where to look for PCBs how to discover what rules apply and why and how to do a self-inspection to be in compliance. We will review the importance of record keeping: who to notify; when to notify; understanding what to keep; and how long to keep the records.

If your institution is unaware of PCB's on the campus, at least in our state, you are better off than if you know they exist. If you are beginning to look for PCBs, of course you will start with the transformers. Don't forget about capacitors and other electrical equipment. There may have been sometime in the life of this equipment that PCB's may have been used to top off the fluid during a repair or service. The serial numbers and nomenclature plates will sometimes tell you exactly what you need to know. Two common names for PCBs are askarel and enterteen. If you see these names, you can be assured you have PCB's. Another way you can locate the information you need is to use the serial numbers and contact the manufacturer. In many of these cases the company will ask you to send them an oil sample and they will, for a slight charge, tell you what you have. The fluid was so common within the recent life of transformers, if you expect the age of the equipment to be 25 years old or more it is the exception rather than the rule for there not to be PCB's.

The EPA issued a "Dear Colleague" letter in the fall of 1989. It was based on the fact that many colleges where not aware of regulations regarding PCB's. Based on this information there are three rules you must keep in mind, and keep accurate records of: if you know you have transformers that contain PCB's you must provide adequate warning through marking the doorways to the area where the transformers are kept; all, and I do mean ALL combustibles must be removed from the transformer's enclosures and at least five meters away from non-enclosed transformers; finally, you must notify the local fire department of the transformer's location within the facility. Your warning labels will need to be very conspicuous. Heaven forbid that the fraternity add these labels to their scavenger hunt during initiation week. The day your painters repaint the mechanical room door is the day the inspector will arrive, guaranteed (Murphy's Law #99838). What is combustible? I'm sure you will agree this is a question that has stumped mankind for years. The definition that is often applied during inspections is anything that is not tied down. The most appropriate method to notify your local fire department is to ask them to come to your campus, take them to the room where the transformer is located, hand them a letter and have them sign that they are aware of the PCB's location and have received notification. The information you must provide them is (A) the

The inspection will occur by the EPA or someone representing them. Don't be too surprised. We will look at who might show up, what forms you will see and how to be ready.

We have recently been through such an inspection. You must know that recently, to the EPA, is two years. Our regional office in Atlanta is so backed up, it takes almost 18 months to work a case to the point notification takes place showing your institution is not in compliance.

Rules relating to polychlorinated biphenyls relating to storage, disposal, etc. are included many places. Most of the information I will use is in the Code of Federal Regulations of 7-1-88. Since the Toxic Substances Control Act was passed in 1978, there has been a regular passage of laws that lead us to where we are today. In 1978 the Marking and Disposal Rule was issued. In 1979 the PCB Ban Rule was passed. This rule set the definition of what would be considered PCB's and what would be considered just contaminated. In 1982 the Electrical Use Rule helped classify transformers by risk and exposure to health. This rule led to the removal of all high risk transformers of this type by October 1, 1985. The next regulation that also set many of the ground rules is the Fire Hazard Rule (1985). This rule established a transformer removal, fluid change out, or installation of fault protection by October 1, 1990.

Transformers will be classified as either contaminated (50 to 500 ppm PCBs), or PCB filled (500 ppm or greater). To fit into the category requiring removal, fluid change out, or the addition of fault protection, they will need to be in or near commercial buildings. As of October 1, 1990, the use of network PCB transformers with higher secondary voltages (secondary voltages equal to or greater than 480 volts, including 480/277 volt systems) in or near commercial buildings is prohibited. As of October 1, 1990, all radial PCB transformers and lower secondary voltage network PCB transformers in use in or near commercial buildings must be equipped with electrical protection to avoid transformer failures caused by high current faults. The term "in or near" has been defined as within 30 meters of a structure. This includes the neighbor of a building that has such a transformer in it.

location of the transformers (B) the fluid contained by the transformer (C)the name and telephone number of the person to contact in case of a fire involving the equipment.

I am sure that mechanical rooms from North Carolina to Kansas and California to Kentucky are the same. You can transfer one room across the country and it would fit almost any school. When you do your self inspection, you must look at what might be considered "combustible" by someone inspecting a transformer for the first time. Taking into account they may never have been in a mechanical room before and they must complete three inspections in the next two days. Now this is probably not who will show up but it is the worst case possible! Look for cans, bags, paper, plastic containers, wooden handles on brooms, covering on insulation, rags, and anything that might burn if placed in a blast furnace capable of melting steel and or used safes.

Oh, don't forget to look at the transformer too! For some reason this is one of the big things they take into account when they arrive at your school. Is it accessible? Does it look as if you have taken some care of it? Remember, many of the inspectors will take into account how the room looks as to whether the transformer is being watched after. You must make a "Good Faith Effort" to comply with all provisions of the law. This includes record keeping as well as prompt notification of the EPA in case of a spill.

As of 1985 transformers must be registered with building owners. This registration must include the specific location of the PCB transformers, the fluid contained in them, and the type of transformer installed e.g. 208/120 etc. Also, combustible materials, not limited to paints, solvents, and paper, must not be stored in a transformer enclosure or within five meters of a PCB transformer. A visual inspection of each PCB transformer in use or stored must be performed at least once every three months: January-March, April-June, etc. There must be 30 days between the inspections. The inspection should not require the electrical to be shut down, but should include a visual search for any leaks around the transformer. If a transformer is found to have a leak, then the transformer must be repaired or replaced to eliminate that leak. Of course, you must always clean up and properly dispose of the PCB material. Clean up must be initiated as soon as possible but never later than 48 hours after its discovery.

Heaven forbid, that you have a fire, but if you do, you must immediately report it to the national response center in Washington, DC. That phone number is (800) 424-8802. In the most severe case, you must take measures as soon as practically and safely as possible to control the release of PCB's. Such response might include blocking floor drains, containing water runoff, and even treatment of the water used to fight the fire.

The records of inspection and maintenance history must be kept for three years after disposal of the transformer. They also must be readily available when your inspection occurs. There are no forms available from the government, but I would recommend the following format (A) the location of the transformer, (B) the date of the inspections, (C) the signature of the person performing the inspection, (D) the location of any leaks, (E) an estimate of the amount of the leak, (F) the date of any cleanup or repair, (G) the description of what was done, (H) the result of any other required action for any uncorrected leaks.

You also must do another inspection at least once every twelve months to reduce the risk of fire. This inspection should include a complete list of all transformers at the sight and any changes that have taken place in the last twelve month period. This maybe referred to as a yearly summary.

After you have removed transformers the following records and documents must be maintained for at least five years. The following is what you must keep and have accessible when the post removal inspection occurs. 1. The dates when PCBs and PCB items are removed from service, are placed into storage for disposal, and are placed into transport for disposal. The quantities of the PCB's and PCB items shall be indicated using the following breakdown: (i) Total weight in kilograms of any PCB's and PCB items in PCB containers including the identification of container contents such as liquids and capacitors; (ii) Total number of PCB transformers and total weight in kilograms of any PCB's contained in the transformers; and (iii) Total number of large, high or low voltage capacitors. 2. For PCB's and PCB items removed from service, the location of the initial disposal or storage facility and the name of the owner or operator of the facility. 3. Total quantities of PCB's and PCB items remaining in service at the end

of the calendar year using the following breakdown: (i) Total weight in kilograms of any PCB's and PCB items in PCB containers, including the identification of container contents such as liquids and capacitors; (ii) Total number of PCB transformers and total weight in kilograms of any PCB's contained in the transformers and (iii) Total number of PCB large high or low voltage capacitors.

If you have a problem, it is your responsibility to notify the EPA and in most cases that means a call to your state. Now we all know the government is here to help us, but a bit of advice is to have your records ready before you call. The state of Kentucky is very helpful in highlighting the information that you need. It just so happens you really can't be an anonymous caller to find information. In almost all instances you will have to leave your name, phone number, or address to find out what you need. You can of course head to your library, dig out the Federal Register from July 1, 1988 and look up the information yourself. Part 761 begins on page 189 and finishes on page 242. It is very light hearted and enjoyable reading. There is a lot of wisdom and not a lot of wit. As in all government publications, redundancy is the norm. The words EPA and PCB will viewed hundreds of times per page.

It will be important that you set up internal procedures to make sure your monthly reports are completed within the three month period, at least 30 days apart. Your yearly reports are very simple unless you have removed a transformer then you must might the second set of rules relating to that information. Remember all records must be kept for a minimum of three years but removal and transport records must be kept for five years at the end of that period you still own the carcass of the transformer or the capacitor if it is buried. I've heard of several companies that will cut up and burn the entire device. So, if you are in the market for this work, be aware there are options.

I've told you that you would have an inspection and believe me you will. In our case the inspection was from the state. As usual I was not in the office. We were able to produce the information that was necessary, the transformers where accessible, and we were not confrontational. We did have some problems. They

occurred due to lack of follow up, a misunderstanding concerning the yearly reports, and a misunderstanding as to what would be considered combustible. The inspectors from the state of Kentucky were very professional. At times they acted almost apologetic, but that did not affect their documentation of what they found. They made comments and suggestions as to how we could improve, they helped by describing how we could respond to the inspection and provided general information on how their procedure would continue. We made an immediate response, took pictures, filed addendum's, and verified documentation. Then we waited.

The forms used by the state of Kentucky where not a group of checklists as you might have expected. They are very simple, they do not leave the total form with you, they only left us a sheet stating they had been here and who went with them.

Eighteen months later we received notification that we were not in compliance. The paper work went from Kentucky to Atlanta, our regional EPA office. When it gets to Atlanta it was assigned to a compliance officer who verified the paper work and turned the information over to the attorneys for the assessment of the fines. The first notification your institution will receive will be a registered letter to the president. This also might be a good time to contact your attorneys. When you reach this point you need to have a copy of the Federal Register from Wednesday, April 9, 1980 Part 3, Environmental Protection Agency, Consolidated Rules of Practices Governing the Administrative Assessment of Civil Penalties and the Revocation of Suspension of Permits. There is a section in this document that relates to PCB penalties.

These penalties are based on three things: the nature of the violation; the extent of, the potential for or actual harm caused; the circumstances surrounding the incident. Don't fear all is not lost. Adjustments can be made in the following ways: culpability (deserving blame); history; ability to pay; ability to continue in business; other factors. Other factors contain such things as attitude, good faith efforts to comply, voluntary disclosure, immediate disclosure, the cost of the violation to the government, the economic benefit you received for the non-compliance, and finally you may be able to reach a settlement with conditions.

There is a gravity based penalty matrix that uses the probability of damages and includes six levels. The second axis contains the extent of potential damage as either major, significant, or minor. Each one of your violations will fit into this matrix and a fine is calculated and entered into the civil penalty assessment work sheet. If that sounds like an IRS form, it looks like one also. From this dollar figure, adjustments are made. This is the sheet that you will work with when your attorneys talk with the attorneys from the EPA.

Our experience, working through this process, has been one of learning. Your information must be clear and accurate. It is important that you have all the forms that the EPA is using so your working from the same information. You will be asked to provide extra documentation that you will not need when the initial inspection is done. Their goal is to follow the law as it is written and it is important for your institution to understand they are flexible only within the guidelines of the written law. Remember, one of the methods available to reduce the fines is ATTITUDE!

In conclusion, "An ounce of prevention is worth a pound of cure". Find the rules, inspect your campus, document your findings, follow through on your inspections, keep records current, expect the unexpected, and have a plan to address the problems that will eventually show up. The information contained in this paper is based on public government documents. It is not a legal opinion. You should use your institutions attorneys for proper legal guidance. Good luck!!!

Impact of the Clean Air Act on Campus Refrigeration and Air Conditioning

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A brief history of refrigeration and the introduction of CFCs.

Significant historical refrigeration milestones:

1859 An ammonia and water absorption system was built.

1873 An ammonia vapor compressor was manufactured.

1876 Methyl ether was used as a refrigerant in shipping meat from Argentina to France.

1880 thru 1890 Several different refrigerants, principally methyl chloride, ammonia and carbon dioxide, were successfully used commercially.

1928 All of the refrigerants in use until this period in time were hazardous in one way or another. These hazards were limiting the development of the refrigeration industry especially with respect to use in private homes, public buildings and other human occupancies. In 1928 C.F Kettering, a VP of General Motors, decided that a new refrigerant was required if the refrigeration industry was ever expected to amount to anything. He asked Thomas Midgely to see if he could find one. In three days Midgely and his associates synthesized what we now call R12 and demonstrated it's viability as a safe refrigerant.

1930 The development of fluorocarbon refrigerants is announced in a paper by Midgely and Henne at a meeting of the American Chemical Society

1931 The original patent for fluorocarbon refrigerants is issued to Midgely, Henne and McNary. R-12 is introduced as a commercial refrigerant

1932 Commercial introduction of R-11.

1936 Commercial introduction or R-22.

1943 First use of R-11 and R-12 as aerosol propellants developed.

1961 Commercial introduction of R-502.

Ozone depletion and the Montreal Protocol.

In June of 1974 Professor Sherwood Rowland & Dr. Mario Molina at the University of California Irvine first proposed that certain chlorine containing compounds could pose a threat to the ozone layer. In response to their proposal the FDA banned the use of CFCs in aerosol sprays in 1978. Recent research has essentially confirmed earlier depletion theories. Thinning of the ozone layer or the "ozone hole" has been observed for some time over Antarctica and more recently in the northern hemisphere. The ozone layer shields the lower atmosphere from the effects of solar ultraviolet radiation. Thinning of the ozone layer is expected to increase ultraviolet radiation effects on the earth's surface. Increased UV radiation is expected to increase the risk of skin cancer in humans, increase incidence of cataracts, damage crops, damage aquatic life, increase ground level ozone pollution and increase global warming.

In response to perceived threats of global ozone depletion representatives from 24 nations signed the Montreal Protocol on September 16, 1987. A production cut back schedule was established in this protocol with a reduction to 50% of 1986 levels by 1998. On August 1, 1988 the USEPA enacted the provisions of this protocol into regulations for the USA. On June 29, 1990 the original Montreal provisions were strengthened and 55 nations signed an agreement scheduling complete phase out of CFC production by the year 2000. A declaration of intent to phase out HCFCs no later than 2040 and possibly as early as 2020 was also added. European nations and Canada adopted a separate statement declaring a phase out of CFCs by 1997 at the latest.

The 1990 amendments to the Clean Air Act

On November 5, 1990 amendments to the United States Clean Air Act were adopted regulating CFCs and HCFCs. A phase out similar to the 1990 Montreal Protocol was a part of this amendment which called for complete CFC phase out by the year 2000. The HCFC phase out called for zero production by 2030. At the time of this writing (April 1992) US legislative activity indicates an acceleration of the CFC phase out to zero production by the end of 1995 with a significant speed up of the phase out in the intervening years. Revised HCFC phase out by 2015 is also being considered.

The CFC tax and it's impact on the cost of service.

In addition to limitations on production of CFCs, a federal tax has been levied on these products beginning in 1990 with a tax of $1.37 per pound (effectively doubling the cost of refrigerants in that year) and ending in 1999 with a tax of $4.90 per pound. At the University of Illinois we have been purchasing about 17,000 lbs of refrigerants per year. About 12,000 lbs per year of this is CFCs and the balance is HCFC (R22). The impact on the cost of refrigeration service should be obvious. Increasing refrigerant costs also make refrigerant recover measures economically attractive.

Taking an inventory of equipment & refrigerant "charge".

In order to understand what measures will be needed to insure the continuation of refrigeration service on campus an inventory of all major CFC and HCFC equipment should be undertaken. The size of the refrigerant "charge" in larger pieces of equipment may be known or can be estimated from known data for similar equipment. Smaller units such as window units, household refrigerators, etc. can be counted up from inventory records or from hand counts depending on the size of your inventory and the type of records available.

At the University of Illinois we have the following inventory of major electric driven air-conditioning equipment:

Refrigerant	Tons	Lbs charge
R500 (CFC)	1624	4552
R12 (CFC)	1441	4953
R11 (CFC)	7650	21890
Totals	10715	31395
R22 (HCFC)	9247	27819

Included in the R22 inventory are about 5000 window airconditioners. The balance of our campus air-conditioning equipment consists of approx. 27000 tons of steam absorption units. CFC equipment comprises about 1/4 or less of our total air-conditioning cooling capacity.

In addition to the air-conditioning equipment there are about 1700 refrigerated water coolers (CFC R12) and approx. 4000 +/- pieces of misc. small refrigerated equipment such as household refrigerators, freezers, walkin coolers/freezers, ultracold boxes, etc. (mostly CFC R12). Based on preliminary inventory figures, these small units are estimated to contain about 1/5 or less of the total campus CFC refrigerant charge. At this writing (April 1992) we are still conducting an inventory of this small equipment.

Refrigerant recovery, recycling and conservation.

In 1989 a refrigerant recovery and recycling program was started at the University of Illinois. One large "portable" recovery machine was purchased for use in the refrigeration shop and for field use on large systems. Five portable hand truck mounted units were purchased for use in the field. Approx. 50 DOT approved cylinders were purchased for storage and dispensing of recovered and recycled refrigerant. The cylinders and the portable recovery machines are designated for use with specific refrigerants and are color coded and marked to indicate the type of refrigerant. In addition to the portable cylinders which are of 50 lb. capacity each, two 600 lb. storage vessels for bulk storage of R12 (CFC) and R22 (HCFC) and a refrigerant transfer system were designed and installed by the refrigeration shop staff. Total investment for this program was about $30,000.

This program has been very successful and has reduced the need for new refrigerant by about 20 percent (CFCs R12, R500, R502 & HCFC R22). In the first year of operation purchasing records indicate avoided costs for new refrigerant at about $10,000. With escalating costs due to the CFC tax, less than three years are expected for payback.

In addition to the recovery and recycling program we are in the process of installing new high efficiency purges on our low pressure centrifugal chillers which use CFC R11. At this writing the first of the new purges has been installed for evaluation. After the evaluation period we plan to proceed with the balance of the installations. It is anticipated that significant reductions in CFC R11 usage will result from this work.

Also at this writing we are experimenting with special ultraviolet visible dyes which allow for pinpointing of leaks in refrigeration systems. The dye,which is soluble in oil, is injected into the system and becomes visible in ultraviolet light wherever slight amounts of refrigerant leak from the system. EPA regulations will require more aggressive leak management measures than in the past.

Restricting purchases of new refrigeration equipment

Beginning in 1989 the design of new refrigeration systems on the University of Illinois Urbana Champaign campus were restricted to non CFC types. Projects designed up until recently have been using HCFC R22. At the time (1989) and until recently that appeared to be the most reasonable choice. Recent legislative discussions have cast a shadow on the R22 option as a long term solution. We are keeping an eye on the market place to see what becomes available as well as monitoring the legislative issue to see what becomes the best option.

Conversions and replacements

The third and most difficult part of the solution to the CFC problem will be conversion/replacement of existing CFC equipment to non CFC use. Dwindling supplies of CFCs will force this measure upon everyone sooner or later. If this work is started now and phased to match the phase out of CFC production, disruption of service can be avoided. Recovery of refrigerants from converted or replaced CFC equipment can be used to "stretch" supplies for the remaining CFC units. Conflicting priorities for campus funds will make this a difficult process.

Alternate refrigerants are currently commercially available to replace some of the CFCs and will be available soon to replace others. There are also some refrigerant "blends" on the market which offer intermediate conversion options. None of these options involve a simple "drop in" replacement of the refrigerant charge only. Mechanical modification of the refrigeration equipment will be required. Each case will need to be considered on an individual basis. The original equipment manufacturer or a refrigeration engineer will need to evaluate the equipment and recommend the required modifications.

Recordkeeping requirement

At this writing the exact nature of EPA mandated recordkeeping requirements are not known. It is known, however, that records must be kept which indicate the disposition of all refrigerants used and where they were used. Records indicating use of refrigerants for each piece of equipment will also be required. We are currently evaluating two proposed record keeping methods.

The first method involves the use of log books which will be used to travel which each cylinder of new or recovered refrigerant until the cylinder is empty. The log books will move from cylinder to cylinder until they are filled with entries at which time a new book will be made up. Log books will also be kept with each refrigerant recovery machine to keep track of how much refrigerant is recovered and where it was recovered from. Log books will be collected periodically and the data entered into a computer data base for tracking of refrigerant by data sorting. Log book entries will include building identification, location, equipment identification, quantities of refrigerant, type of refrigerant, date, operators name, etc.

The second method will involve the use of a form included with each refrigeration shop work order. The form will contain the data indicated above and will be used to enter data into the computer data base.

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Implementing an Environmentally Safe Chilled Water System

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Abstract

The effect of the Montreal Protocol, and its subsequent amendments, has serious implications to managers of large facilities such as college and university campuses. Illinois State University has implemented a planned replacement of electric chillers using R-11 refrigerant with chillers using R-22 refrigerant. While R-22 is scheduled for depletion by 2020 the equipment purchased will work efficiently with other existing refrigerants that do not affect the ozone layer. This plan allows the University to replace its equipment in a coherent fashion addressing maintenance needs while also keeping existing R-11 units operational.

The chillers specified by the University's plan had a higher initial cost than "comparable" equipment. The Physical Plant performed a life-cycle cost analysis to justify the purchase of the desired chillers independent of any potential savings of the refrigerant. Installation of new chillers was done with University personnel for additional savings. Based on the success of this program the Physical Plant is looking at load balancing schemes between electric and steam/absorption chillers for additional savings and environmental conservation.

Introduction

Illinois State University (ISU) has implemented a plan to address the campus's needs for air-conditioning and to comply with EPA regulations both now and in the future. The plan was developed after looking at: available refrigerants with relative efficiencies; different machines and their ability to use different refrigerants; operating costs; maintenance costs; the anticipated life of existing equipment; and the distribution of equipment throughout the campus. This paper attempts to describe how other large facilities managers, such as colleges and universities, may develop a plan based on their needs, to address the inevitable regulations and restrictions necessary to protect our environment.

Illinois State University has over 5.6 million square feet of space of which about 4 million is air-conditioned. Ninety percent of the air-conditioned spaces are centrally cooled using large chillers (15 tons to 800 tons). Eight major facilities have absorption chillers that take advantage of available steam. The total cooling plant is about 10,000 tons. In addition to general space conditioning the university has 38 systems for cooling and freezing of food. These units range in size from 1-1/2 to 20 ton units in the campus's central bakery. A recently built arena, while not presently air-conditioned, will additionally demand 1,200 tons of cooling.

Because of recent news coverage and environmental concerns the EPA has been revising refrigerant rules annually. The regulations at this writing indicate that CFCs will be phased-out by 12/31/95. HCFCs are scheduled for phase-out by 2030; some companies are voluntarily planning phase-out by 2020. Phase out means reduction and halt of production of these refrigerants by the chemical companies. The use of these refrigerants may still continue in machinery presently using these refrigerants until they are completely used up by the machine operator or are outlawed.

The phase-out of refrigerants is particularly burdensome on campuses that are older and have primarily window air-conditioning units. ISU's campus is primarily comprised of buildings constructed since 1950 and have large central air-conditioning equipment. As manufacturing of various refrigerants stops facility managers must schedule maintenance and replacement of equipment to maximize use and minimize cost. This is easier with large systems because of the ability to modify the equipment or utilize conservation equipment.

Refrigerants

The effect of CFCs and HCFCs on ozone has been known for some time. In 1974 University of California at Irvine chemists, Sherwood Rowland and Mario Molina theorized that CFCs reached the upper atmosphere and as they broke down to their fundamental elements, released chlorine atoms and destroyed ozone molecules. Their theory has subsequently raised concerns due to recent observations of the ozone layer that surrounds the earth and its filtering effect on ultra-violet light.

The federal government has identified the relative tendency of different refrigerants to break-down in the stratosphere and destroy ozone. Because R-11 and R-12 are equally

damaging and the worst offenders, they have been given a value of 1.0. Other refrigerants damage the ozone layer according to the following table:

R-11	1.0
R-12	1.0
R-113	0.8
R-114	1.0
R-115	0.6
R-22	0.05
R-123	0.016
R-134a	0.0

While many different refrigerants have been used in different applications it is important to understand why some are preferred over others. R-11 is more efficient in providing cooling than R-123 by about eight percent. The efficiencies of the most poplar "sage" refrigerants are shown in the following table:

R-22	.668
R-123	.618
R-134a	.696

R-12, R-134a and R-22 are high pressure refrigerants. Refrigerants such as R-11 and R-123 are low pressure refrigerants. High pressure chillers must meet ASME pressure vessel specifications and are typically heavier because of the requirement to meet the specifications. Because of the low operating pressures of chillers using R-11, the equipment generally meets only the specifications or standards of the manufacturer. Machines designed to handle low pressure refrigerants can be placed almost anywhere in a building: basement, roof, penthouse, interstitial floor, etc. without much regard for the loads. High pressure machines must be treated carefully in a building to make sure their structural load can be handled.

Chillers

Illinois State University primarily has centrifugal and rotary screw chillers. There are a few reciprocating chillers that are older. We have attempted to standardize on rotary screw chillers for maintenance and flexibility reasons. We find we have greater flexibility with a rotary screw chiller because they can compress a wide range of fluids.

There is the additional advantage that rotary screw chillers have typically been used for applications greater than 80-300 tons or for the creation of ice. Due to the increasing popularity of these chillers they are now available up to 2,000 tons.

For maintenance reasons we have also preferred chillers that have open compressor motors rather than hermetically sealed motors. Open compressors have the electric motor outside of the refrigerant stream. Hermetically sealed compressors have the electric motor

in the refrigerant stream. ISU has selected open drives for all its new chillers because of the concerns surrounding replacement refrigerants and efficiencies. When one considers the steps necessary to convert from R-11 to R-123 it is necessary to replace the motor windings on a hermetic compressor. If that were not done the corrosive differences between R-11 and R-123 would quickly destroy the compressor motor and the refrigerant with it.

In addition to the differences regarding refrigerant characteristics, when the motor is in the refrigerant stream it is necessary to consider the heating effect of the motor on the refrigerant when determining the efficiency of the chiller. If the motor, which is hot relative to the refrigerant, is outside the refrigerant stream the chiller has less to cool (unless one air-conditions the equipment room). An open machine is thus more efficient by its design as long as there is sufficient ventilation for the machine to operate.

Open drives are also easier to maintain because the more maintenance intensive motor is outside the refrigerant stream. If service on a hermetically sealed compressor is required the machine must be purged of all refrigerant prior to gaining access to the motor for repairs. While this was not a problem previously, due to the low cost of refrigerants and ignorance of the environmental problems, more expensive steps are now required to comply with the law when servicing a hermetically sealed motor.

Solution

Our first step was to check all existing chillers for leaks and correct any deficiencies. We developed a program and purchased equipment to recover and reclaim refrigerants. We also installed high-efficiency purge units on all chillers. We continued our program to check chiller tubes with an eddy current test bi-annually.

Next we considered the above factors and selected R-22 as our refrigerant of choice. We are familiar with it and it will be readily available for about 25 years. A better selection might have been R-134a which has no apparent effect on the ozone layer because it contains no chlorine. The selection of the refrigerant also considered our preference in chillers. We selected rotary screw, open-air drive compressors because of the ability to compress almost any fluid without changing the impeller, and ease of maintenance including no need to purge the chiller when motor maintenance is required.

We have further justified our selection of refrigerant and chiller through life-cycle cost analysis. The economic analysis considered operating life of the chiller, required maintenance costs and time, capital costs, and efficiency versus the cost of utilities. Each machine was sized to match the characteristic cooling needs of the facility intended to be cooled.

We have additionally, because of regulations prohibiting release of refrigerants into the atmosphere, are in the process of installing refrigerant leak detectors in equipment rooms. The detectors will be connected to the campus building automation system and monitored at all times.

Future Plans

Illinois State University recognizes that it must make a decision on which refrigerant to switch to so we will comply with future EPA regulations. The present, ozone-safe, replacement refrigerant for R-22 is propane. This is not desirable due to its flammable characteristics. A mix of propane and another refrigerant may also prove successful and not be flammable.

Another possible refrigerant, R-717, or ammonia, might also be used. It has been used almost exclusively in the food processing area because of its high efficiency and relative safety. Ammonia has typically not been used in commercial, populated, applications because of the negative connotations of ammonia smell. This may be one of the advantages of ammonia because it is easily detected in minute quantities (53 ppm). However, ammonia is explosive in high concentrations with an ignition source of 1,203 degrees F or above. Monitoring will still be required to protect against this problem. In the Midwest we are accustomed to ammonia because farmers use it regularly to fertilize their fields. The major disadvantage with ammonia is the required change in piping from copper to steel or aluminum.

We are also considering load balancing between electric and steam/absorption chillers. As an example, we are presently installing a chilled water loop connecting several buildings. One building has a large absorption chiller (600 tons), the others are chilled out of a central chiller facility which houses five 160 ton rotary screw chillers. The intent of this connection was originally to provide electric curtailment capability to our campus which has an interruptible power agreement with the local electric utility. We have discovered, however, that it may be possible to save even more money by eliminating peaks in electric demand by utilizing the absorption chiller instead of electric units even when we are not required to curtail consumption. There are plans for the future to tie other buildings together with the same intent and to replace electric chillers with absorption units where more than one chiller exists in a facility and there is sufficient space.

Another possible load balancing and refrigerant reducing solution will be to create a thermal energy storage (TES) facility, using either ice or chilled water. Chillers can be sized smaller and run at night when electric demand is low.

Summary

Illinois State University has reviewed present and proposed EPA regulations concerning CFCs and HCFCs. We have reviewed out existing chiller equipment considering remaining life, efficiencies, and maintenance. We evaluated different types of chillers considering the ability of the chiller to handle different refrigerants efficiently. We also considered operating costs, maintenance needs, familiarity with equipment, and equipment life. We then selected standard chiller characteristics and implemented a program for replacement of worn-out equipment and the recovery of existing refrigerants to keep original equipment operational until the program was complete. We are continuing to evaluate our plan with consideration to future trends in cooling and operating efficiencies.

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Race Into the Twenty-first Century Fueled by Natural Gas

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Why Natural Gas?

Growing public concern for our environment combined with the even increasing cost of gasoline have created anew and promising light on alternate fuel adoption in the United States. The transportation fuel sector represents 30 percent of the energy demand and 60 percent of the petroleum demand in the United States today.

Extensive studies have been performed on alternative fuels. Compressed natural gas (CNG) appears to have the greatest promise for broad scale adoption because of its vast domestic supply, supreme emission performance, and high safety record.

The technology is not new. Natural gas has been used for over 50 years to fuel vehicles, and currently over 500,000 vehicles operate on natural gas worldwide in countries such as Italy, New Zealand and China.

Economics

Because it is cheaper to produce and transport, natural gas costs less than gasoline. The miles per gallon equivalent of CNG is approximately the same as gasoline, but an equivalent gallon of natural gas costs 40 to 60 percent less than a gallon of gasoline. At the same time, the driver gets a natural gas octane rating of 130, as opposed to 87 to 95 for gasoline.

Compressed natural gas is cleaner burning than gasoline so a vehicle can go 60,000 miles between oil changes and the same distance before requiring a spark plug change. This coupled with a 25 percent longer engine life can add up to reported savings of 40 to 50 percent for a transportation fleet. An added bonus is smoother operation.

Safety

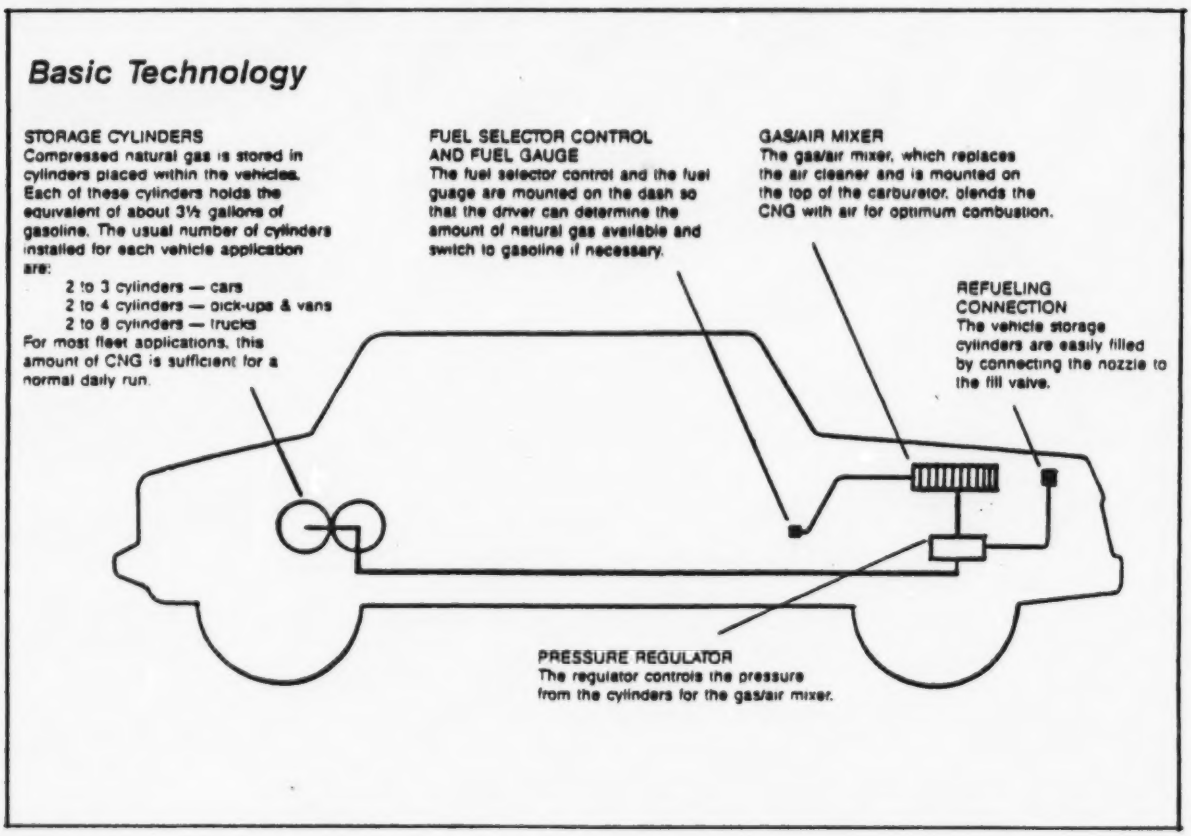
Natural gas is safer than gasoline. It is lighter than air (a specific gravity of about 0.6) so any spills or leaks will quickly dissipate into the atmosphere. In open air, natural gas will not explode or detonate. With an

air/fuel mixture in vehicles of approximately 85 percent air/15 percent gas, the flammability range is very narrow because it is more difficult to ignite than gasoline. The ignition temperature of natural gas is higher than gasoline (1200 degrees F for natural gas, 600 degrees F for gasoline).

CNG is stored in thick-walled steel or aluminum cylinders and wrapped in fiberglass for added protection. Accident surveys, based on 434.1 million vehicle miles, show that natural gas vehicles are safer than gasoline powered vehicles. No fatalities, burn accidents, or other serious injuries associated with CNG fuel systems have occurred. School bus fleets and Disneyland both rely on the safety of CNG to carry their precious cargo.

Conversion

Converting a gasoline vehicle to CNG is a simple process. There is no removal of original parts, and the storage cylinders are mounted in the rear of the vehicle. Vehicles can be converted entirely to CNG or can be converted to run on both CNG and gasoline. A fuel gauge switch installed on the dash


Basic Technology
STORAGE CYLINDERS
Compressed natural gas is stored in cylinders placed within the vehicles. Each of these cylinders holds the equivalent of about 3½ gallons of gasoline. The usual number of cylinders installed for each vehicle application are:
2 to 3 cylinders — cars
2 to 4 cylinders — pick-ups & vans
2 to 8 cylinders — trucks
For most fleet applications, this amount of CNG is sufficient for a normal daily run.
FUEL SELECTOR CONTROL AND FUEL GAUGE
The fuel selector control and the fuel guage are mounted on the dash so that the driver can determine the amount of natural gas available and switch to gasoline if necessary.
GAS/AIR MIXER
The gas/air mixer, which replaces the air cleaner and is mounted on the top of the carburetor, blends the CNG with air for optimum combustion.
REFUELING CONNECTION
The vehicle storage cylinders are easily filled by connecting the nozzle to the fill valve.
PRESSURE REGULATOR
The regulator controls the pressure from the cylinders for the gas/air mixer.

permits selection of either natural gas or gasoline operation. Thus results in a bi-fuel vehicle and has the advantage of an extended fuel range. The vehicle can be switched from one fuel to the other while in operation--no stopping is required.

Vehicles emit three major pollutants--carbon monoxide, reactive hydrocarbons, and nitrogen oxides. Dedicated natural gas vehicles (using CNG only) are the only type of vehicles that have been demonstrated to meet future emission standards. Compared to current vehicles, natural gas vehicles could achieve:

1. More than 90 percent reduction in reactive hydrocarbon and carbon monoxide as compared to gasoline.

2. Total elimination of toxic pollutants contained in gasoline and diesel fuel.

3. A 30 to 70 percent decline in nitrogen oxides.

No underground storage tanks are required for storage, thus there is no underground leaking to pollute the soil as underground water supplies.

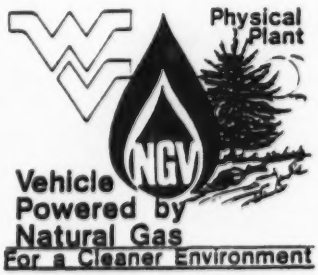
Supply

Natural gas is readily available today in every major community. Vehicles use the same natural gas provided by the 1.2 million-mile under ground pipeline systems that supply American homes and millions of factories and businesses every day. For many years refueling stations designed for fleet vehicles have been part of this far reaching distribution system. This existing system has the capacity to safely and cleanly transport natural gas for vehicle use.

Natural gas is an abundant American fuel. Our resource base is huge; with current technology and consumption, the United States has a 50-year supply in the lower 48 states alone.

West Virginia University and Consolidated Natural Gas

Funding is always in short supply. However, the money is there if you know where to look. It could be a grant from a local gas company, funds from your state legislature, or from the school's budget. At West Virginia University, it came through the local gas company. Hope Gas Inc., invested $85,000 to provide a natural gas compressor station and conversion units for the vehicles. Consolidated Natural Gas Company, Hope's parent, and the CNG Foundation have contributed $500,000 to the West Virginia University Capital Campaign, part of which is being used by the University for the project. The grant is to be given in $100,000 installments for each of the next five years.

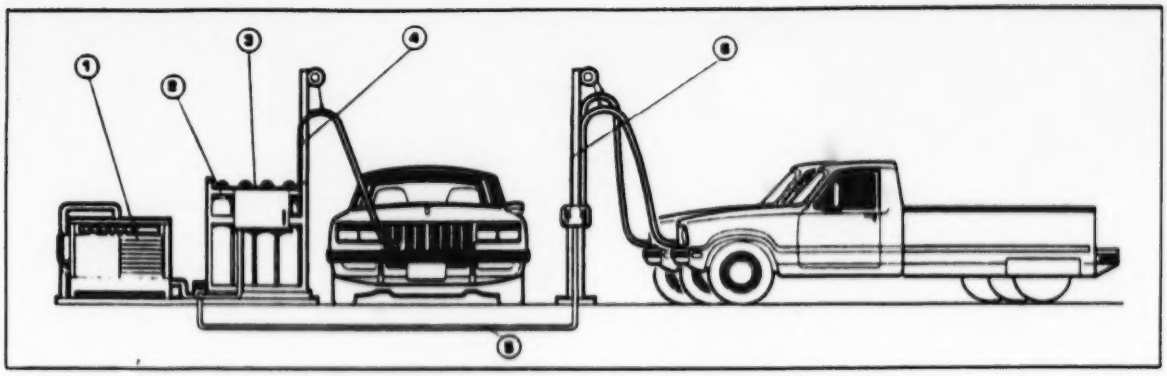


During Phase I of the conversion, 50 vehicles were converted and a fueling station installed. The training of five mechanics allowed WVU to complete the vehicle conversion in-house thus cutting expenses.

Though WVU's vehicles will be bi-fueled, they plan to maximize their benefits by operating solely on CNG.

The project is now in Phase II which includes studies and analysis of the benefits of natural gas.

Future funds will be used to install another complete compressor/filling station and to convert another 150 vehicles from other WVU departments such as the farms, Athletic Department and Public Safety.



The fifth and final phase will be to update and automate the entire system.

For West Virginia University, this has been a very successful operation. In addition, to cleaner, smoother operation, the savings have been considerable. The miles-per-gallon on CNG are approximately the same as for gasoline, however, for WVU the per gallon equivalent cost is 42.7 cents as compared to $1.19 per gallon for gasoline. With an average annual use of 16,000 gallons, this results in a savings of $12,208 for West Virginia University this year alone in current expense.

Limitations

There are presently a limited number of natural gas refueling stations nationwide. However, the State of West Virginia is dedicated to making this work and plans to have five refueling stations along the Interstate by Fall of 1992.

The cost of converting a vehicle to operate on natural gas is about $800 to $1,200. However, many fleets can achieve a two- to three-year payback on this investment due to the reduced fuel costs, reduced maintenance expense, and extended engine life.

The Alternate Fuel Vehicle Training Program

West Virginia University has applied for a 20 million dollar grant from The American Gas Association to establish an Alternate Fuel Vehicle Training Program to encourage and guide the development of a training/technology transfer infrastructure and provide a location for the citing of industries, government agencies and research organizations essential to the long-term growth of an alternate fuel vehicle industry. It will develop a model training program for AFV conversions, operation, maintenance and safety and extend this program to serve a national audience. It will become a national repository for AFV technology and best practices, and disseminate this information to support excellence in the AFV industry, encourage the adoption of AFV technologies and advance state-of-the-art.

Conclusion

Considering the cleanliness, economy, safety availability and abundance of natural gas, it is easy to see why more vehicles are running on this versatile fuel. In the coming year, there will be an increasing number of vehicles running on alternative fuel, and because of its benefits, natural gas will be the alternative fuel of choice--clean energy for the road ahead into the 21st century.

Solid Waste Management: A Global Imperative

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"It's 1991: Do you know what your trash is?" So starts an article in the May 1991 issue of National Geographic (page 123). The article stresses some interesting points that will have a major impact upon the future of trash and trash disposal in the 1990s. For instance, it is estimated that every man, woman, and child generates four pounds of trash every day (up from 3.5 pounds in the late 1980s).

As gross disposed pounds increase, landfill disposal space is decreasing at an alarming rate, with subsequent increases in disposal and tip surcharges. A speaker at a recent seminar conducted in Chicago indicated that 50 percent of the current landfills will be closed by the end of 1995. Persons choosing to ignore their garbage may be in for a rude awakening in this decade, and may find themselves figuratively, if not literally, buried in trash.

As the amounts of waste increases, so are disposal rates. Some segments of the United States are paying more than $100 per ton for disposal of nonhazardous waste. On top of these escalating rates are the tip surcharges levied by local communities. As trash mounts, space is declining. Our ability to dispose of the trash is decreasing because our available budget dollars are not keeping pace with the rapidly increasing cost of garbage disposal.

Is there an easy and rapid answer that will provide a solution to this problem? There is an answer, one that has been under our noses literally for decades; the solution, like the answers to many of life's problems, is complex but highly practical. The answer is to recycle products, and to implement an effective waste minimization plan. There are economic and ecological incentives to do so. Jack Debell, the recycling director at the University of Colorado (cited in Environmental Management, January 1991), indicates that the average person in an office discards more than 175 pounds of valuable high-grade

paper per year. The American Paper Institute states that the average American uses 650 pounds of paper a year, and the vast majority ends up in the landfill. High-grade recycled paper may generate more than $70 per ton, much more in some geographic areas.

In addition, Debell cites that "harvesting waste paper from cities [dare we say a college campus?--question is mine] creates five times as many jobs as does harvesting the raw materials from forests. Over time, there is money in trash!

Jeff Vincent of IBM states that "if we can reduce our waste, it boosts profitability." According to Vincent, an environmental engineer at the Rochester, Minnesota division of IBM, the company currently recycles 63 percent of its waste material--3,656 tons of it in 1989. At $75 per ton for tipping fees, the company saved $275,000. IBM is not alone, and the following example illustrates the potential impact upon the environment.

Cheryl LaPerna, recycling coordinator for AT&T's office paper recycling program, says in New Jersey alone the company saved at least $372,000. This translated into 62,395 trees that were saved from logging (and made for happier owls?); almost 16,000 cubic yards of waste didn't have to go to the landfill; and they saved the equivalent of 9,176 barrels of oil. (The IBM and AT&T examples are extrapolated from The Full Circle: Recycling Newsletter, Spring/Summer 1991.)

Recycling makes both dollars and sense over the long haul, and has an incredible impact upon the environment. This fact has not been ignored by some of the major retailers. Both Walmart and K-Mart are now stressing the environmental issues in many of their in- store displays, indicating their concern and commitment to the environment. In addition, in many states, recycling is either the law or quickly becoming the law. Many states have established recycling goals and objectives.

Communities are beginning to ban items from their landfills, such as tires, mattresses, batteries, grass clippings, leaves, large appliances, motor oils, solvents, and paints, just to name a few. Failure to abide by applicable laws may result in a fine or a surcharge. For these reasons alone it is imperative that the university community be in the forefront of recycling efforts. A proactive, responsive, and ethical waste disposal and minimization program will reap ecological, environmental, economic, and legal benefits that will prepare our institutions for the 1990s and the twenty-first century!

In order to begin a recycling program, a paradigm shift is imperative. The shift requires that, both mentally and physically, institutions and facilities move from the opulence of the belief that resources are there to be exploited in a never ending supply, to the understanding that resources are becoming increasingly limited, and the ability to dispose of end-user trash ad infinitum has become a thing of the past.

The paradigm shift should include a minimum of four

elements: reeducation in the very way we think and process solid waste, a reduction in the amount of products that enter the waste stream from both purchasing sources to end-user waste, a reuse of materials whenever practical, and recycling. The elements are progressive in nature, and it is interesting to note that recycling comes last as indicated by the editors of Full Circle: Recycling Newsletter. One of the best indicators of this shift is illustrated by Cheryl LaPerna of AT&T when she said, "I want the whole world to know how easy it is to recycle."

Once the shift is realized, the institution is on the threshold of a realistic solid waste management program for the 1990s. In order to effectively manage an integrated waste management program, a series of steps must be followed as discussed below. These steps are intended to be in a sequential order, based upon the inputs of numerous institutions nationwide; however, it is realized that no particular program is suited to all institutions and that each organization may opt to select only those steps that are meaningful to its institution.

Commitment and Cooperation

It is absolutely imperative to solicit the commitment and cooperation of executive decision makers and implementers of decisions at any level. As many elements of the university community should be involved, including but not limited to, environmental health and safety; risk management; purchasing; schools of biological, environmental, and health sciences; solid waste generators such as food services, residence halls, laboratories, printing services, campus facilities, physical plant, faculty, students, and employees, especially building services or custodial representatives as these persons are your most important resource in the handling and disposal of solid waste.

In addition, selected inputs may be solicited from environmental community leaders. If a committee approach is warranted, it may be wise to heed the admonition of Tom Lindmeier, an editor of an environmental newsletter. On recycling, and recycling committees, he states: "Don't study it ... research it ... committee it ... or task force your company's waste problem right into the ground. The time to take action is NOW!"

The cooperation and commitment should extend beyond verbal support, and should be integrated into a written, communicated, and established university plan that includes specific goals and objectives that are realistic and meet or exceed legislated standards. Solid waste management programs cost money, and oftentimes these monies have to be established up front, with the cost prorated over several years. A commitment of policy support without fiscal commitment is about as effective as a tiger without teeth!

Recycling Coordinator

It is vitally important, in an institution of any size, to establish a recycling coordinator who is dedicated to and enthusiastic about the goals and objectives of a recycling program. Establishing the recycling program by using "an additional assigned duty" to a manager with an already overburdened workload is establishing a recipe for defeat, no matter how dedicated the manager. Many of the most effective programs have recognized this up front, and have taken the plunge to fund a full- or part-time position. It is estimated that to start an effective solid waste management program a person will expend a minimum of three to four full days per week, and a large campus may require significantly more time.

Solid Waste Audit

Once the cooperation and commitment of each level is achieved, and a recycling coordinator appointed, the next step is to implement a solid waste audit and analyze the solid waste stream. In other words, become a Sherlock Holmes and discover, in a quantitative way, the amount of each major type of trash in the waste system. An audit could be by volume, by weight, or projection using a similar community. Before any type of trash audit is established, it is necessary to define and develop the gross tons of trash generated by the campus. Such information may be obtained from your contracted waste disposal company, landfill where you haul your waste, or by weighing your vehicles (unloaded and loaded). An analysis of the trash will be somewhat meaningless if a clear baseline is not established from which to compute percentages.

Having established the gross amount of waste generated, the next step in the audit is to develop an instrument to measure and track what is in the waste stream. A survey tool that measures the major categories of waste should include paper, cardboard, food or organic wastes, metals, glass, plastics, construction waste, etc. Each major category might have subcategories such as paper, which may have categories of white paper, colored paper, computer paper (white), computer paper (green bar), etc. Once the survey instrument is developed, it is time to start analyzing the trash.

One method is to randomly select samples of trash from all types of buildings on campus, and have the waste analyzed by assigned personnel, by sheer volume, which is actually an estimate. If a six cubic yard dumpster is analyzed, what percentage of the waste is paper, plastic, cardboard, etc.?

Another method, again using random sampling of all types of buildings, is to select the dumpsters, and then physically set aside a location to pour out the dumpsters and weigh the contents. A caution on doing this is in order. Coordinate this type of activity with your environmental safety/risk management

offices; digging through discarded trash could present potential risks, even if protective equipment is worn.

A third method is to mail out a survey to all solid waste generators on campus, and solicit their support in developing percentage estimates of the amount of waste, and the types of waste, flowing through their offices or buildings.

Probably the most realistic method is to use a combination of all methods. The waste audit is the most important process in determining the long-range goals and objectives of an integrated solid waste management program. Failure to clearly define baseline volumes and quantities will make it difficult to proceed into future steps of a recycling program.

Developing Marketability of Recyclable Products

Once the baseline volume or weight is determined, it is easy to then project, using survey results, the approximate amount of major categories of products that might be sold to potential buyers. Initially, it is probably wise to concentrate on the one to three major categories of solid waste generated, that may include paper products, cardboard, plastics, metals, or glass (whichever are specific to your institution).

Work closely with your purchasing department. Buyers may be approached based upon the volume of recyclables available on campus to determine approximate or estimated resale costs and revenue generation projections. It may be economically feasible to sell high-grade office papers and computer paper, but practically impossible to generate any revenue (and maybe significant losses) by selling newspaper or telephone books.

Once the marketability is established, it is time to sit down with the potential buyers and determine the necessary collection modes and points. Will the products be collected by building, by clumps of buildings, or from a mass storage area? Your local vendors will be able to help you with this. Be advised to steer clear, if at all possible, of a sole source environment. Find as many potential buyers as possible and then competitively bid out your products. Much of the marketability, and practicality of marketing the recyclables, will be contingent upon quantities, quality, and location of your institution.

Using your survey results of the types of solid waste generated by your facility will enable you to develop realistic markets. You may be surprised by the accuracy of the results of your survey, as well as your projections for marketability, when all are tabulated and averaged.

A 1990 analysis using a by-volume survey method was conducted on a mid-sized university campus in APPA's Central Region; the results were quite interesting when compared with national norms. According to the survey of this particular campus of 25,000 students, the solid waste stream was 48.9 percent paper, 18.7 percent plastics, 11.3 percent cardboard, 7.7 percent metals, 4.0 percent glass, 7.5 percent organic, and 1.9 percent

other. A 1991 scientific study conducted by *National Geographic* indicated that an analysis of solid waste indicates 50 percent is paper, 10 percent is plastic, 1 percent is glass, 13 percent is organic, and 20 percent miscellaneous. In the major categories, especially papers, the by-volume study related both very closely together.

It is important to track the source of each type of solid waste. Obviously, most of the standard office and computer papers will be generated from administrative and academic areas. However, one study indicated that the largest generators of cardboard on a campus were the residence halls, specifically pizza boxes. Much of the metals or organic wastes are found in the food services areas.

By conducting the survey by major categories of waste, and tracking to specific categories of buildings, the recycling coordinator, in conjunction with committees or advisory groups, will be able to make intelligent decisions about where to establish recycling programs, containers, and bulk recycling modules for collection points.

Selecting a Collection System

Many companies would love to sell large universities collection systems that are, usually, quite expensive. The American Paper Institute indicates in its literature that source separation is probably one of the best systems. Each person at a desk or within an office sorts out the recyclable categories, then brings this to a central container on their floor. Many of the successful college systems then have their housekeeping personnel (or the buyer of the products) remove the containers to a loading dock in the building. These containers are then emptied and returned to their original location (by either housekeeping or vendors).

Several universities have interesting case studies. One has contracted their entire recycling of paper to a local concern. The concern provides all the containers free of charge and moves, empties, and replaces these containers, and then pays the university a nominal fee. No expense or labor is incurred by the university under this program. The down side is that the end refund cost for the recycled items is usually low.

In another case, a university uses a student initiated program, collects soda cans and newspapers in specific containers (cardboard containers that are plastic lined for soda cans). The soda cans are collected weekly by the housekeepers and deposited on the loading dock. At a prearranged time, the university delivery system picks up the containers and deposits them in a secured 40-cubic yard covered dumpster that is removed by the local recycling company. The end cents per product is much higher, but there is more university labor involved.

Some other universities have opted to use all student labor (paid at student rates), class projects, or combination of students and regular employees. The key to making any of this

successful and workable is having an active and effective recycling coordinator. The students are often energetic; however, after a few years, the classes turn over, and one could be back at square one. The recycling coordinator provides a consistency from year to year and can more easily keep up to date on industry changes.

Probably the best approach is to use the system that costs the least, maximizes the potential for returned dollars, and runs effectively. Each university may have different resource pools to draw from. A combination of several sources will probably increase the potential for long-term success.

Education

It is absolutely critical to develop and initiate an effective education program using student groups, faculty advisors, and staff personnel. As the logistics of analyzing solid waste and developing recycling strategies is in progress, a clearly defined education program should be in progress. Such a program should be directed at both the head and the heart. Solid arguments may be developed from factual literature; however, a fair amount of professional persuasion and public meetings will be necessary.

As mentioned earlier, the arguments for recycling are effective: it is an ethical alternative to polluting the planet, it is a viable alternative since landfills are reaching capacity, it is an economic alternative since it is becoming increasingly costly to dispose of waste, and it is a legal imperative since many states are now legislating that recycling programs be implemented.

Waste Reduction or Minimization

Up to now we have discussed recycling, however, maybe even more important is how to minimize solid waste from ever entering the waste stream and if it does, how to handle it in an effective manner. Many strategies are available.

For instance, solicit products from vendors while minimizing the amount of packaging involved. Use containers that are shipped in recycled and recyclable plastics. Several companies now have a return program; you ship back the empties (at no cost) while receiving the new shipment. Several janitorial supply companies, rather than shipping items in five-gallon plastic containers, are now shipping items in recyclable five-gallon boxes (exterior) with plastic internal collapsible bladders, some of which can be recycled.

Buy products in concentrate form. A national manufacturer of fabric softener now sells its fabric softener in a concentrated form. It comes in a very small carton, and the purchaser then adds water at home. By using concentrate, containers are minimized, shipping is less, and more storage is available.

In food service areas, move away from the use of plastics, paper, and styrofoam products. Ensure that shipping containers, whenever practical, are made of products that can be recycled. A Canadian company is now marketing eight-ounce individual milk cartons in plastic disposable bladders rather than in waxed cardboard cartons.

In office areas, photocopy on both sides and use scrap paper for writing drafts or memos. The reuse of file folders (flip over and change dates for following year or relabel), reconditioning toner cartridges, reinking ribbons, or simply using electronic mail may go a long way to reducing waste. A number of recycling publications provide insightful information about how to minimize waste and reduce the amount of potential waste entering the waste stream of an institution.

Waste can also be minimized in areas such as landscaping and grounds by recycling clippings and leaves, chipping or mulching tree limbs, or composting (which may minimize fertilizer purchases). Other areas of your facility can recycle items. Car tires can be used as an alternate energy source in some boilers, as can other forms of solid waste. Car oils and batteries can be recycled and kept from the waste stream. Several recycling companies are now recycling pallets.

Indeed, an integrated solid waste management program starts at the pre-procurement stage and follows through to the final recycling and disposal of the end product. One newspaper company recycles its expended newsprint by loading the unused papers into a rail freight car. The rail freight car is then returned to the mill. Based upon a prearranged plan, the mill provides the newspaper company with rolls of free newsprint. The possibilities are nearly limitless.

Community Participation

The university community is a microcosm of the larger community in which it exists, works, and plays. A successful university recycling program will work closely with community leaders and agencies. A case in point is a university in Indiana that opens up its recycling boats to members of the community. The boat is a 40-cubic dumpster on wheels, with segregated areas that are caged (to avoid pilferage) and provide drop off points for glass (clear and colored), cans, and other forms of containers. The boats have doors to keep products dry and free from the weather. This program has proven to be a community success. A boat is on campus for part of the campus and community program, and boats are located throughout the local community for use by all members of the community. The university directly benefits from the income generated by the boat on campus.

Distractors

Paradigms have been mentioned on several occasions, and there are

several philosophies that can detract from a potential recycling program. These detractors or distractors need to be overcome, because solid waste management and recycling is an imperative for the 1990s. Such distractors may include arguments that recycling will cost money and human resources. This is true, but the alternative is that if something is not done soon, it will cost more money in the long run. If you decide to do nothing for now, what are you going to do when your local landfill closes (because your school was one of the institutions that filled it up in the first place!)? Or if your dumping fees that might have been $20-$30 a ton are now $100 or more per ton because you have to ship the waste 100 miles?

Many states have chosen to implement legislation requiring purchasing goals and recycling goals, and many more have pending legislation. These rules, rather than getting easier, will become more restrictive. Those organizations that have started early in the process will be well ahead when legislation is enacted. The time to set up your program is now, while the opportunity exists to conduct a thorough examination of your alternatives, to develop an effective solid waste audit, to provide an efficient waste collection system, to educate personnel, and to implement a solid waste minimization program that is proactive rather than reactive.

Conclusion

Many schools and universities have started the pathway to professional solid waste management programs. Many stellar examples come to mind including, but not limited to the University of Colorado in Boulder, Cornell University, Dartmouth College, University of Illinois/Chicago, University of Minnesota, University of Missouri/Columbia, University of Nebraska/Lincoln, University of Notre Dame, University of Wisconsin/Parkside, and Washington State University.

One of the professional enrichment advantages afforded by an organization such as APPA is the ability to network with true professionals. Universities and colleges have a unique opportunity to be in the forefront of solid waste management. The imperative for such programs has been established by economics, legislation, environmental concerns, and ethical issues.

The facilities management organization is in a critical position to enhance the image of the institution and to be on the cutting edge of change in the handling of solid waste into the year 2000 and beyond!

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